TWENTY-FIFTH YEAR

The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

Vol. XXV. No. 8.
$2.00 a year. 30 cents a copy.

AUGUST, 1928

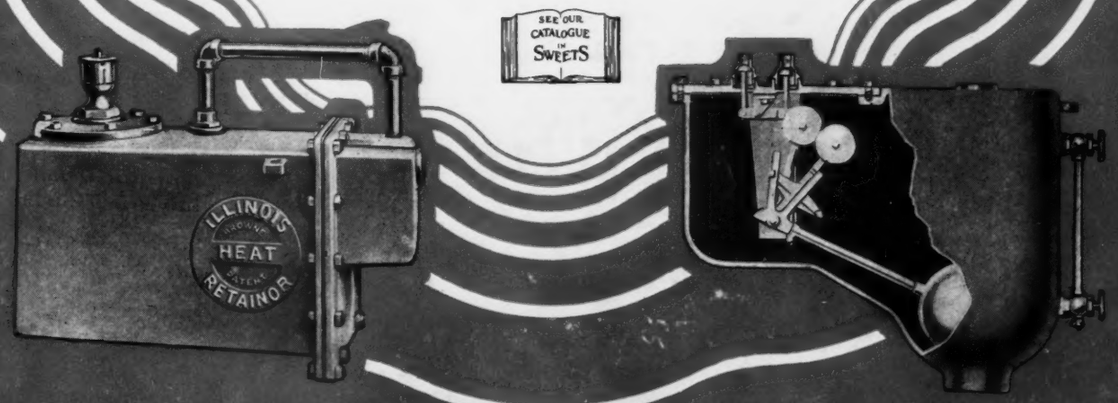
Heating & Ventilating Magazine Co.
366 Fourth Avenue, New York.

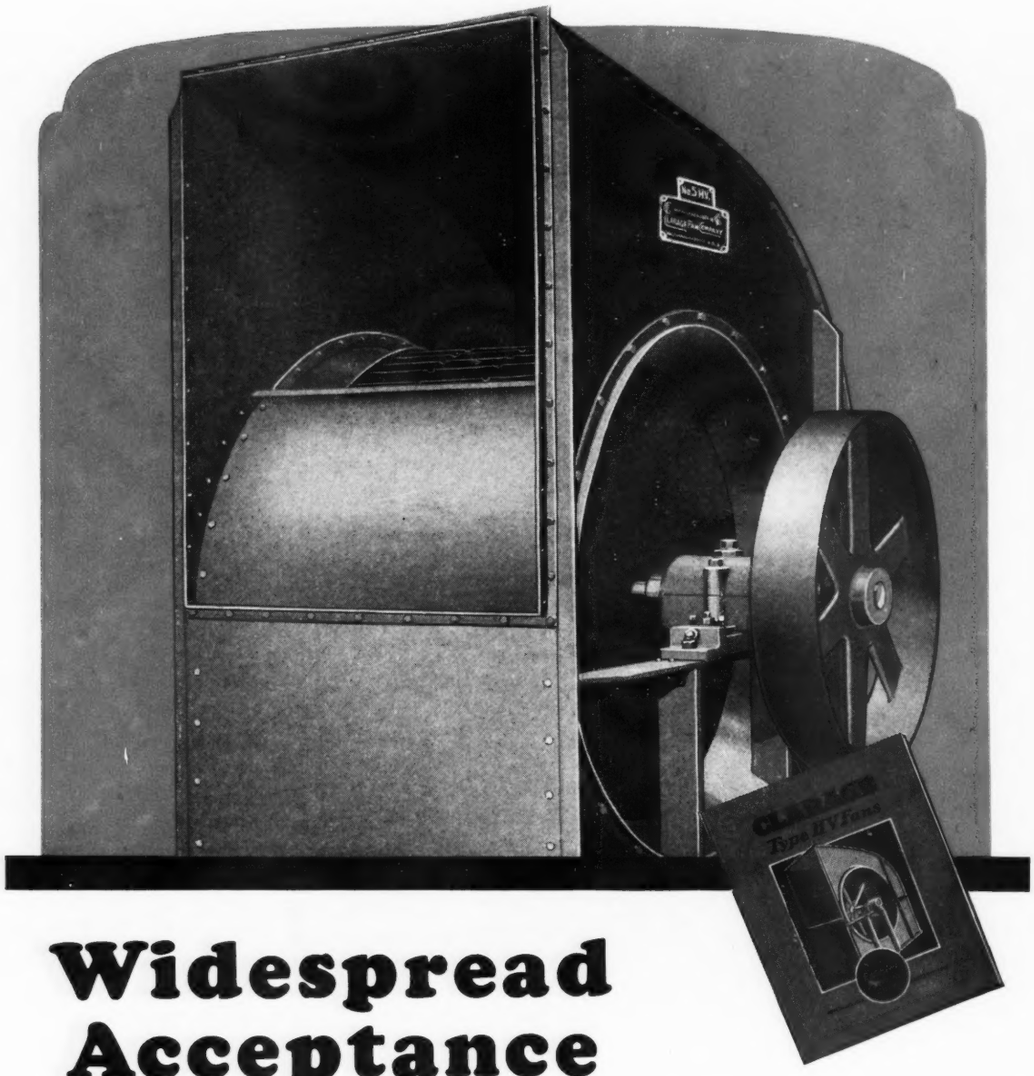
LIBRARY
MICHIGAN STATE COLLEGE
OF AGRI. AND APP. SCIENCE

Solve your exacting Heating Problems with time-tested dependable ILLINOIS *Products.*

ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD. PRES. INCORPORATED 1900
BRANCHES AND REPRESENTATIVES IN 40 CITIES
CHICAGO

SEE OUR CATALOGUE IN SWEETS





Widespread Acceptance

FOUR years ago this company pioneered the Clarage Type HV Multiblade Fan.

Today, thousands of these HV Fans are installed and in continuous operation. Not one motor has been overloaded. Not one fan has failed to perform as specified by Clarage engineers.

Today, more and more are architects and engineers consistently endorsing this equipment. More and more are contractors consistently using it. The HV Fan has gained widespread acceptance for all classes of ventilating and air conditioning work.

And why? Principally, because the high efficiency (77% maximum guaranteed) enables this fan to reduce operating costs in a substantial way.

Write for Catalog 54, as shown above, which gives full performance data.

CLARAGE FAN COMPANY, Kalamazoo, Mich., and Principal Cities

CLARAGE

TYPE HV FANS

77% EFFICIENT

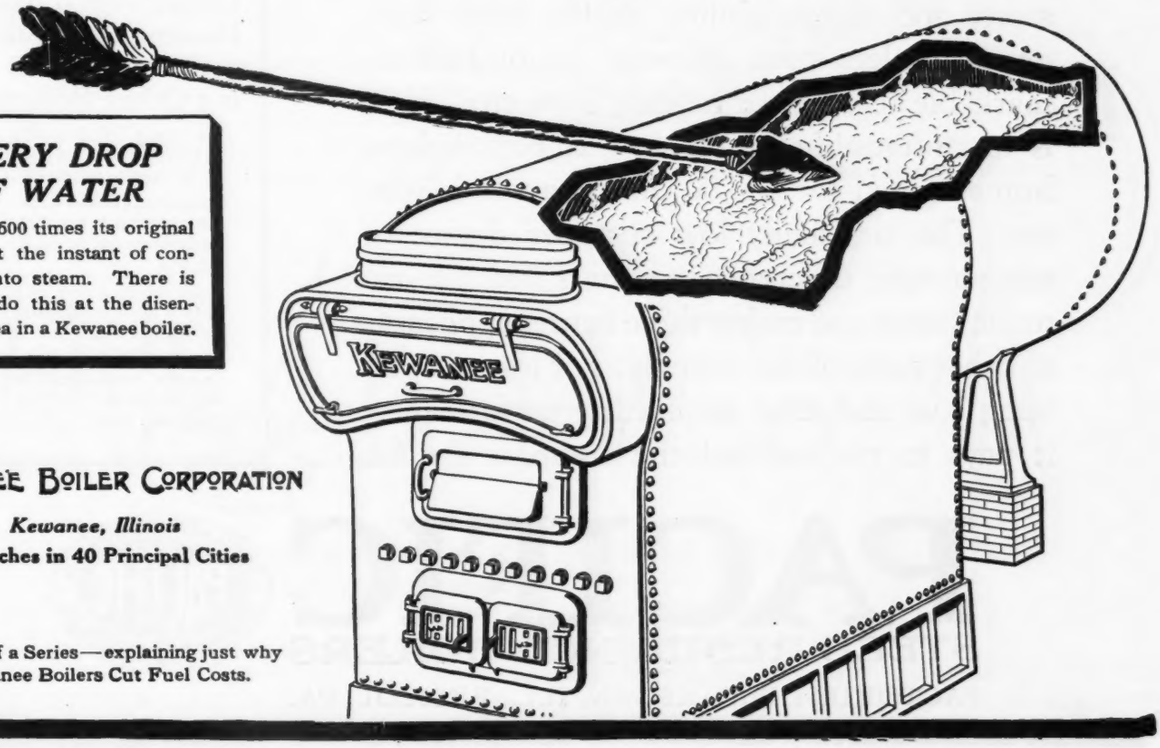
KEWANEE STEEL BOILERS

Lower Heating Costs

The disengaging area, where all the newly formed steam bubbles are liberated from the water into the steam space, must be extensive.

If these steam bubbles are crowded into a congested outlet (like the neck of a bottle) the boiling-over effect will be so violent that water will be carried out with the steam.

The large unbroken steam disengaging area provided in the Kewanee design reduces priming and foaming to nothing, keeps the steam supply to the mains dry, thus adding considerably to the total efficiency of the boiler. This is just one more reason why Kewanee boilers *lower heating costs.*



EVERY DROP OF WATER

expands 1600 times its original volume at the instant of conversion into steam. There is room to do this at the disengaging area in a Kewanee boiler.

KEWANEE BOILER CORPORATION

Kewanee, Illinois

Branches in 40 Principal Cities

Fourth of a Series—explaining just why Kewanee Boilers Cut Fuel Costs.

THE HEATING AND VENTILATING MAGAZINE, published by THE HEATING AND VENTILATING MAGAZINE CO., at 386 Fourth Avenue, New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents. Vol. XXV, No. 8, August, 1928. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

It Cost $48.00 to heat this home all winter . . .

L. E. FORD, PRESIDENT J. L. SOWELL, JR., VICE PRESIDENT W. W. SOWELL, SECRETARY-TREASURER

FORD-SOWELL REALTY COMPANY, INC.

REAL ESTATE, SALES AND DEVELOPMENT

2117 FIRST AVENUE NORTH
PHONE MAIN 6493

BIRMINGHAM, ALABAMA

April 19,1927

Pacific Steel Boiler Corp.,
1218 Age-Herald Bldg.,
Birmingham, Ala.

Gentlemen: Attention Mr. Hayden Myer.

You may be interested in knowing that the smallest residence type Pacific Boiler is installed in my home, with 444½ feet of radiation, has proven most satisfactory. I can truthfully say that this system of heating is economical because during the past winter I only burned about six tons of soft coal at $8.00 per ton. I could possibly have used a cheaper coal and burned no more but the coal used was highly recommended to me.

If ever I can recommend your products I will be glad to do so and thanking you for the interest and consideration you have shown.

Yours very truly,
L E Ford

LEF:AC

Residence of L. E. Ford, Redmont Park, Birmingham, Ala. Chas. H. McCauley, Architect. O. F. Payne, heating contractor. One No. 201 Steel Pacific Residence Boiler installed.

While building up a national reputation for safety and dependability, Pacific Steel Residence Boilers have likewise established remarkable records for heating economy. Here is an interesting example — a Birmingham home heated for $48.00 during a whole winter. The unusually low cost per degree of temperature difference accounts for the climatic factor and makes these figures applicable to other parts of the country. For lowest operating cost and most satisfactory performance, it pays to recommend the compact Pacific.

Compare This Heating Cost with the Cost of Operating Other Boilers

Heating load: 444½ square feet direct C. I. steam radiation.

Fuel Used (1926-7 heating season): 6 tons bituminous coal at $8.00 per ton.

Cost of heating per square foot radiation: 10.8¢ per year.

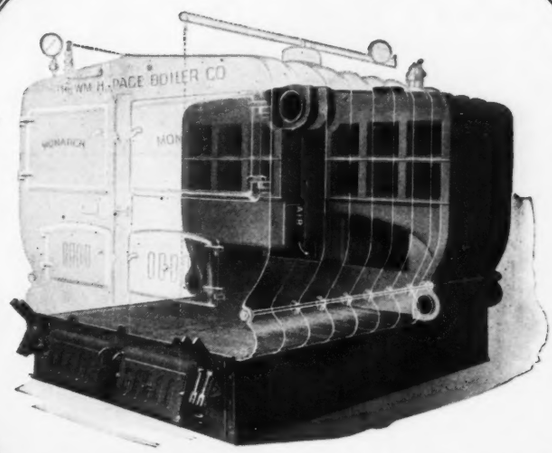
Cost of heating per degree temperature difference: .00772¢ per yr. per sq. ft. radiation.

PACIFIC
STEEL RESIDENCE BOILERS

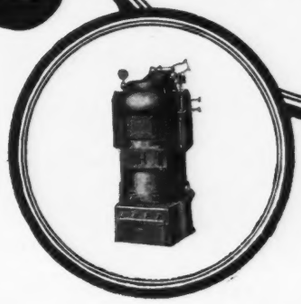
STEEL HEATING BOILERS · PACIFIC · WAUKEGAN, ILL. BRISTOL, PA. · TRADE MARK REG. U.S. PAT. OFF.

FACTORIES: WAUKEGAN, ILL., BRISTOL, PA.

Price?



60" MONARCH SMOKELESS STEAM BOILER



MANY people think that Page is a much higher priced boiler than it really is. This is not strange when you consider that for more than 70 years the name PAGE has been synonymous with a quality product and heating satisfaction. But the first cost is as low as that of an ordinary boiler, and the fuel expense will be less.

Page Boilers are built for strength and durability, and with care will outlast the building in which they are installed. They are made in all sizes, for very small as well as very large jobs, and are adapted for burning economically any coal, oil or gas. The Monarch Smokeless Boiler illustrated will burn soft coal smokelessly. Approved by communities with most rigid smoke ordinances.

Write for catalogue and profit yielding prices.

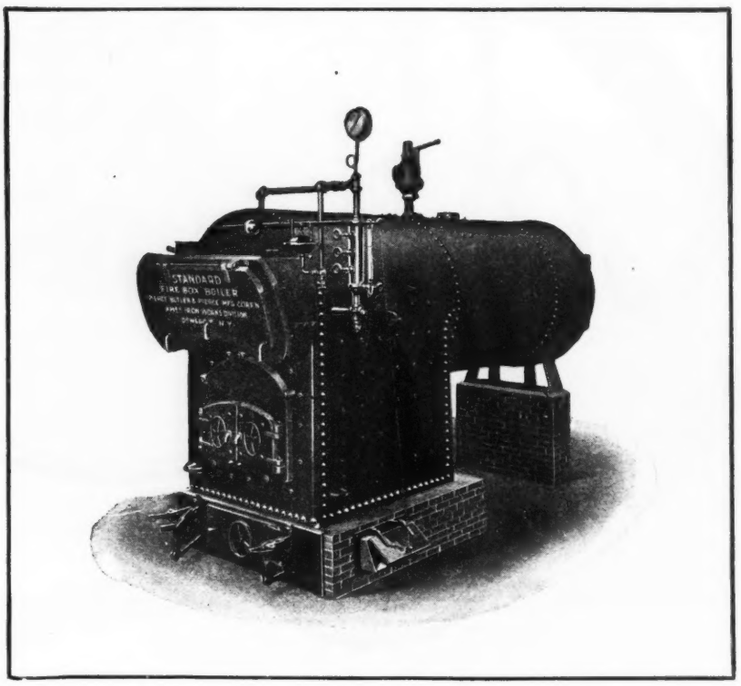
The Wm H Page Boiler Co

General Offices: 200 MADISON AVENUE, NEW YORK CITY

BRANCH OFFICES AND WAREHOUSES:

BOSTON, 123 Beverly St.
CLEVELAND, Rose Building.
WASHINGTON, 1117 15th St., N. W.
PHILADELPHIA, 1126 Washington Ave.
BROOKLYN, 98 - 49th St.
Factory: MEADVILLE, PENNSYLVANIA

AMES



FIREBOX HEATING BOILERS

AMES IRON WORKS

Division of

PIERCE, BUTLER & PIERCE

MANUFACTURING CORPORATION

Main Office and Works

OSWEGO, N. Y.

General Sales Offices

41 EAST 42nd STREET, NEW YORK CITY

fire burns up-hill

COAL ROLLS DOWN

The camper hangs his kettle up above the fire, for fire burns *up*. The camper builds his fire of sticks piled in a pyramid, for fire burns *up-hill*. The Spencer Gable-Grate is sloped to make fire burn up-hill, the way it burns easiest and best.

Men are careful about taking a big rock from the bottom of a slope. Bottom support removed may cause a landslide of all above. Fuel in a Spencer Magazine rolls down because fire takes fuel away from the bottom of a slope to make more roll down by gravitation.

Here's how you can share in the success of this new selling plan

Last month the Spencer Heater Company made an important announcement. Two new Spencer Heaters were presented—designed to burn not only No. 1 Buckwheat anthracite, but also by-product Pea coke or any non-coking graded fuel. At the same time a new, sales-making, bigger-than-ever advertising campaign was begun.

In the "fire that burns up-hill" Spencer Heaters have created a new sales-making idea. It was successful overnight. In the new Spencer Heaters, a wider opportunity, a greater market than ever, for Spencer Heaters, was created for you.

Here is how you share in that wider market, in that increased success.

With every heating bid, file an alternative bid on a Spencer Heater. Show your prospect, as you can, easily and simply, how the Spencer can save as much as half the annual bill for heat.

All you need to do is to show how many tons of coal a year a flat grate heater needs. Multiply that number by the difference in price between egg, stove and nut anthracite, used in ordinary heaters, and the cost of lower-price fuels — No. 1 Buckwheat for instance. That will show your prospect just how much a Spencer saves. Do the same with by-product Pea coke or any non-coking, graded fuel, for the Spencer is designed to burn any of these low-cost fuels.

Heating contractors have found that they can increase their income surprisingly by this simple plan. The reason is just as simple. The Spencer costs a little more, although these new Spencers cost less than ever before, and home owners and building operators are glad to pay the difference for the saving that a Spencer makes year after year. That extra cost means larger sales for you, and larger sales mean larger profits. You get all your profit, too, for you don't whittle it all away in competitive bidding.

Write for details of the new co-operative selling plan that will help you to share in the increased success of this one outstanding leader in the heating field. Spencer Heater Company, Williamsport, Pa. Division of Lycoming Mfg. Co.

A Spencer requires attention only once in 12 to 24 hours.

SPENCER $ SAVES

SPENCER
steam, vapor or hot water
HEATERS

The Campaign Is On *For* Burnham Boilers

With A Full Ticket In The Field

The candidates you know by name and reputation.

They appeal for your vote on their record for heating satisfaction and fuel thrift.

Their platform is non-partisan and they promise a fair deal for everyone.

Popularity assured.

Vote for Burnhams and you'll get yours.

Get on the Burnham Band Wagon.

Vote as often as you like. We'll count all votes, and you'll be well paid when *you* count the shekles.

CANDIDATES

For Heating Jobs

1 Round Sectional
2 Square Sectional
3 Marine Tube Type
4 Smokeless

For Hot Water Supply

1 High Pressure
2 Junior Boiler
3 Laundry Stove

For Radiation

Burnham Fero Radiators

Burnham Boiler Corporation

IRVINGTON, N. Y.

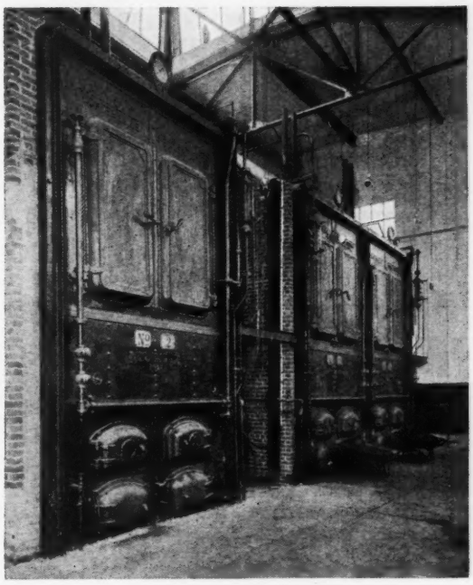
Representatives in all Principal Cities of the United States and Canada

—and in this $2,000,000 Hospital two COATESVILLE BOILERS are installed

During the latter part of January, 1928, the Jeanes Hospital formally opened its doors for the treatment of cancerous and pre-cancerous conditions. It was provided for in the will of Anna T. Jeanes of Germantown, Phila., Pa.—and is located at Fox Chase, near that city.

It is significant that Two 201 H.P. Coatesville Horizontal Return Tubular Boilers were chosen for the heating and power requirements of this great public benefaction. These Boilers are 78″ x 18′, and are equipped with 3½″ tubes. They burn buckwheat coal on Mershon grates.

The Architects were Heacock & Hokanson and the Heating Contractors and Engineers were Bowers Bros.—both of Philadelphia.



Coatesville Boilers Are the Result of Nearly a Half Century's Experience.

Manufactured by the COATESVILLE BOILER WORKS, Coatesville, Pa.

Philadelphia	Pittsburgh	New York	Baltimore	San Francisco	Boston	Newark
111 S. 15th St.	Union Trust Bldg.	30 Church St.	Lexington Bldg.	945 Pine St.	141 Milk St.	60 Park Place

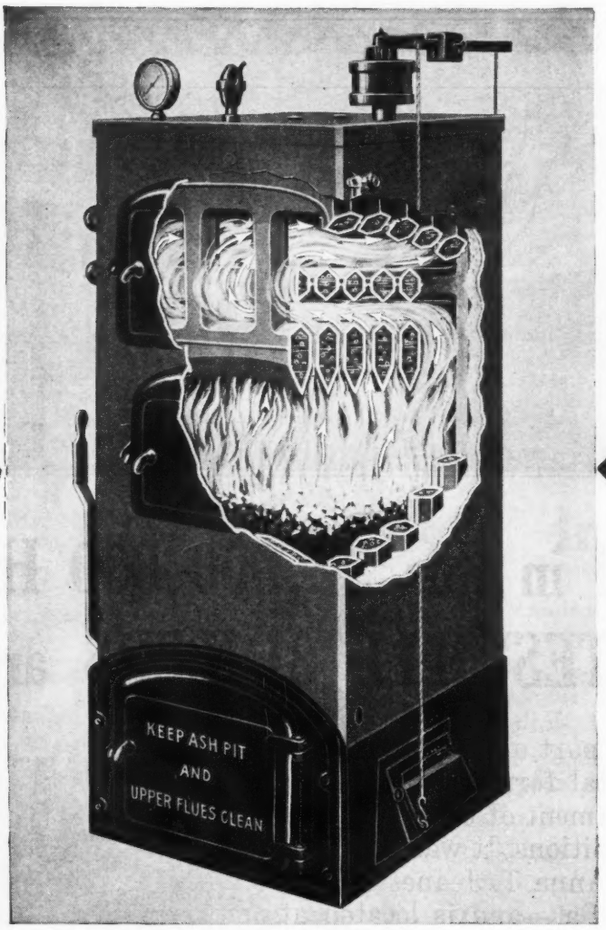
---

Distributed by

NATIONAL RADIATOR CORPORATION

Ten plants devoted to National Service through these Branch Offices and Warehouses:

Baltimore, Md.—2622 Frisby Street Boston, Mass.—93-97 Oliver Street Milwaukee, Wis.—124-130 Jefferson St. New York, N. Y.—55 W. 42nd St.
Buffalo, N. Y.—259-265 Delaware Avenue Louisville, Ky.—1126 W. Breckenridge St.
Chicago, Ill.—2445 N. Keeler Avenue Cleveland, Ohio—935 E. 63rd Street Omaha, Neb.—108-112 S. Tenth St. Philadelphia, Pa.—121 N. Broad St.
Cincinnati, Ohio—Spring Grove and Elmira Avenue Pittsburgh, Pa.—1509 Arrott Building
Indianapolis, Ind.—431 W. Georgia Street Johnstown, Pa.—221 Central Ave. Richmond, Va.—3032 Norfolk St. St. Louis, Mo.—1042 Central Industrial St.
Washington, D. C.—2205 Fifth Street, N. E.



The NATIONAL JACKETED BOILER

This Boiler has a trim, durable, dust-defying empire green jacket, that houses a dependable, efficient boiler. It burns hard or soft coal, coke, oil, or gas. It is furnished for either steam, vapor, or hot water systems. Handsome and effective.

THE JUNIOR MEMBER OF A LARGE FAMILY

OUTSTANDING POINTS

Attractive—Durable empire green enamel finish, black trim.

Insulated—A thick layer of rock wool between jacket and boiler.

Efficient—The double set of three flue-ways provides a long forward and back fire travel.

Convenient—Exceptionally deep fire box permits heavy fueling; requires infrequent attention.

Dependable—Its heating qualities have been demonstrated on many and varied installations.

Time-Saving—Large doors make firing and cleaning easy.

Adaptable—Efficiently burns hard or soft coal, coke, oil, or gas.

Versatile—For use on steam, hot water, or vapor systems.

The National Jacketed Boiler is the junior member of a large and highly regarded family. With its snappy, durable empire green finish and glossy black trimmings, it is up-to-the minute in appearance. And it has the National family traits of quality, dependability, and effectiveness.

Its large fire box holds a heavy fuel charge; frequent attention is thus made unnecessary, and combustion efficiency is boosted. Fire travel is long, so the gases can give up their heat. A heavy layer of rock wool insulation cuts heat losses. Large doors make firing the boiler, and cleaning flues and ash pit simple, easy tasks.

The National Jacketed Boiler wins admiration by its appearance, earns respect by its performance. It's all you expect of a National Product.

NATIONAL RADIATOR CORPORATION

Manufacturer of Radiators and Boilers

Ten Plants devoted to National Service through these Branch Offices and Warehouses:

Baltimore, Md.—2600-2622 Frisby Street Boston, Mass.—93-97 Oliver St. Louisville, Ky.—1126 W. Breckenridge St. Milwaukee, Wis.—124-130 Jefferson St.
Buffalo, N. Y.—259-265 Delaware Avenue New York, N. Y.—55 W. 42nd St.
Chicago, Ill.—2445 N. Keeler venue Cleveland, Ohio—935 E. 63rd Street Omaha, Neb.—108-112 S. Tenth St. Philadelphia, Pa.—121 N. Broad St.
Cincinnati, Ohio—Spring Grove and Elmira Avenue Pittsburgh, Pa.—1509 Arrott Building
Indianapolis, Ind.—431 W. Georgia St. Johnstown, Pa.—221 Central Ave. Richmond, Va.—3032 Norfolk St. St. Louis, Mo.—1042 Central Industrial Ave.
Washington, D. C.—2205 Fifth Street, N. E.

AERO

NATIONAL JACKETED BOILER

NATIONAL PRODUCTS
UNION · NIAGARA · CUMBERLAND
OLEAN · CONTINENTAL · NATIONAL

The New Boynton
Detroit's latest addition to her Public School System is equipped with
Titusville Boilers

¶ The most eloquent expressions of customer satisfaction and approval are the repeat orders that invariably follow a Tico Boiler installation.

¶ Witness, for example, the Boynton School modern in every detail, in which was originally installed a Tico smokeless boiler two years ago.

¶ A year later they decided to install an addition boiler and another Tico was chosen because of the very satisfactory service rendered by the original boiler. *Write for Bulletins.*

THE TITUSVILLE IRON WORKS COMPANY
TITUSVILLE, PENNA.

New York 152 W. 42nd Street
Chicago, Ill. 111 W. Monroe Street
Detroit, Mich. 204 Owen Building
Buffalo, N. Y. Marine Trust Building

Sales Offices:
Cleveland, O. 118 St. Claire, East Cleveland, O
Charlotte, N. C. 705 Realty Building

Washington, D. C. 626 Woodward Building
Los Angeles, Calif. 940 Maple Avenue
Pittsburgh, Pa. Farmers Bank Building
St. Louis, Mo. 401-2 Bank of Commerce Building

Stanwood

Smokeless Boilers

Rapid Circulation

The intense heat from the combustion chamber induces a rapid circulation through the water grate tubes, discharging water and steam into the mass of water above the fire tubes near the water level. The circulating water is carried through large pipes from the rear of the shell below the center line, up to a horizontal manifold or cross header at the front of the furnace, from where it is distributed into the water grate tubes.

This arrangement provides means of obtaining a rapid and positive circulation of the water in the shell, at the same time extracting a maximum of heat from the gases before discharging into the chimney. The heat is extracted through the water grate tubes, the fire tubes and surface of each head.

Thus the heating surface of the boiler becomes more effective because it transmits more evenly the heat from the gases in the tubes to the water in the boiler.

Reduce heating costs!

The circulating arrangement of the Stanwood Smokeless Boiler contributes largely to the complete absorption of all heat units and low stack temperature.

In addition to the efficient water circulation, the remarkably low water line, accessibility for cleaning, entire absence of mudlegs, staybolts and crown sheets are important factors in the reduction of installation and maintenance costs.

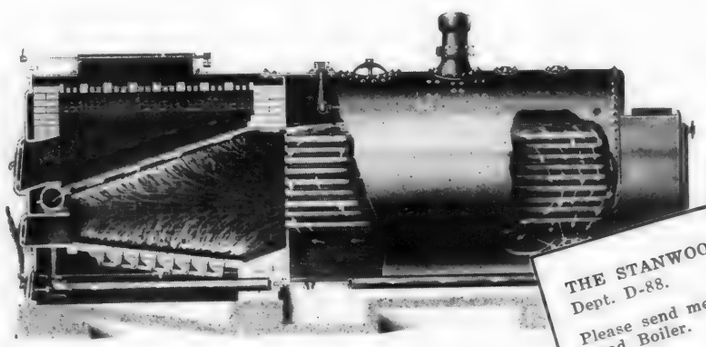
These outstanding features of Stanwood Boilers *reduce* heating costs.

THE STANWOOD CORPORATION

Manufacturers also of Horizontal Return Tubular Boilers, Stacks, Breechings, Tanks, Feed Water Heaters, Throttling and Automatic Steam Engines.

Est. 1891 **Cincinnati, Ohio**

Built in sizes from 29 to 250 H.P. (3500 to 31,000 sq. ft. steam radiation) for working pressures of 15, 100, 125 and 150 lbs. Built for higher pressures if desired.



STANWOOD Boilers are built for coal, oil or gas.

THE STANWOOD CORPORATION,
Dept. D-88. Cincinnati, O.

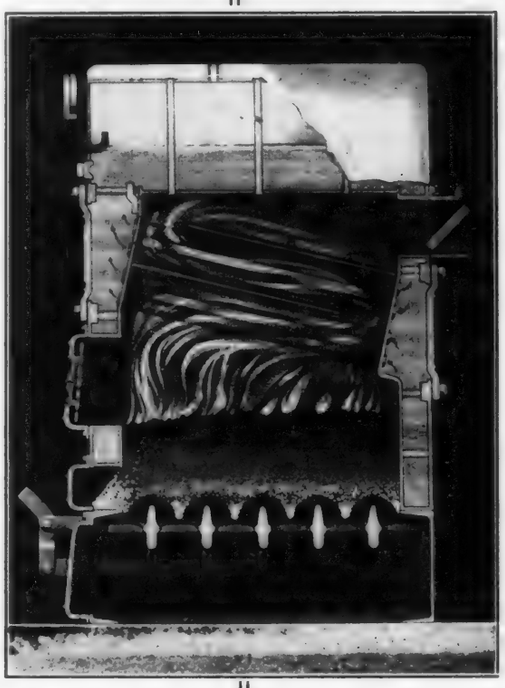
Please send me details of the Stanwood Boiler. ....H.P. .....Pressure.

Name .....

Address .....

KNOWLTON WATERTOOB STEEL BOILERS

Use Coal in Knowlton "Watertoob" Boilers



Then you will have complete satisfaction in—economy—rapidity of heating—attention. The "Copper" water tube construction does it.

Write for booklet "Complete Heating Satisfaction" which tells the rest of the KNOWLTON *Story.*

ORR & SEMBOWER, Inc.

Reading, Pennsylvania

(Established 1885)

208 N. Clinton St., CHICAGO 50 Church St., NEW YORK

The BETTER BUCKWHEAT BURNER

COIL

STEEL HEATING BOILERS AND WATER HEATERS

FOR OIL BURNING

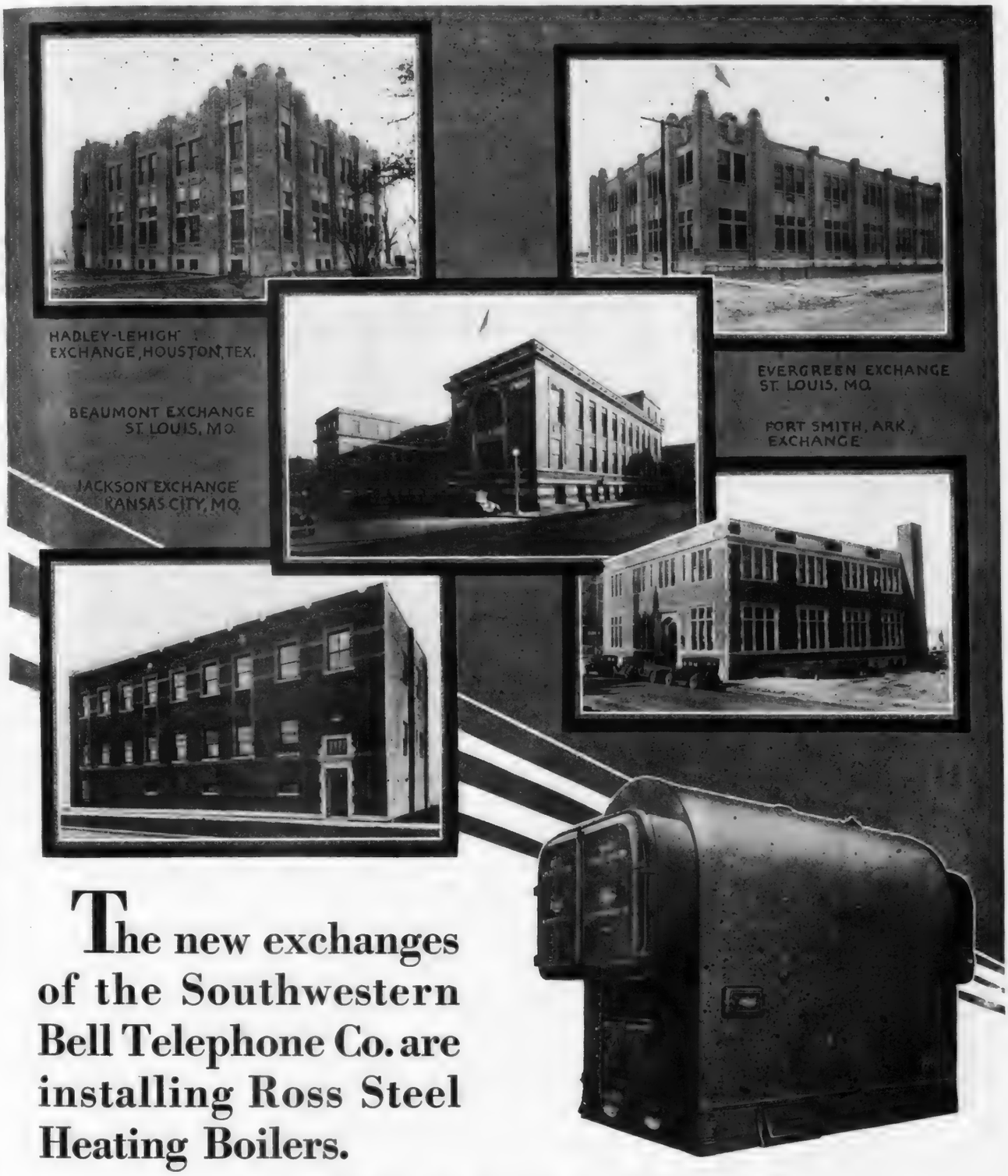
THE amount of heating surface per unit of rating is exceptionally high in Coil Boilers. This great amount of heating surface is properly placed in relation to the fire so that it is tremendously effective.

This important fact simply means that with the Coil Boiler you can get more heat with the smallest possible consumption of oil.

Write for Catalog

MONITOR BOILER COMPANY
1505 Race Street PHILADELPHIA, PA.

ROSS STEEL BOILERS


HADLEY-LEHIGH EXCHANGE, HOUSTON, TEX.
BEAUMONT EXCHANGE ST. LOUIS, MO.
JACKSON EXCHANGE KANSAS CITY, MO.
EVERGREEN EXCHANGE ST. LOUIS, MO.
PORT SMITH, ARK., EXCHANGE

The new exchanges of the Southwestern Bell Telephone Co. are installing Ross Steel Heating Boilers.

The Frost Manufacturing Co.
SINCE 1851
GALESBURG . . ILLINOIS
Branches in Most Leading Cities

History has richly endowed this spot-

-a building worthy of its setting

THE site of this superb structure... 39 Broadway... is said to be the location of the first erection of any kind, by the Dutch, on Manhattan Island (1615). Here General Washington made his home at the time our first Congress was in session and when New York was the Capital of the nation. Once, in the same dwelling lived the first minister of France. History has richly endowed this spot... crowning it now with an architectural achievement worthy of its setting. Rising majestically, thirty-six stories into the air, this fine structure may well appear as a fitting monument to three centuries of building progress.

The Harriman Building's high place among modern architectural creations is not based on size any more than on the character of construction... stability as well as beauty is reflected throughout. Within this structure are numerous engineering achievements, among them being a modern piping system of unusual efficiency, designed and installed to assure continuous and satisfactory service for heating, water supply, fire protection, sanitation, etc. The major pipe tonnage of this system is "NATIONAL"—The Recognized Standard for Building Purposes.

NATIONAL TUBE COMPANY
Frick Building, Pittsburgh, Pa.

NATIONAL
HARRIMAN BUILDING
39 BROADWAY, NEW YORK CITY
Architects: Cross & Cross
Consulting Engineer: J. Byers Holbrook
General Contractors: Geo. A. Fuller Company
Plumbing Contractors: J. L. Murphy, Inc.
Heating Contractors: Baker, Smith & Company, Inc.

On almost any heating job, one of these

GAS BOILERS

is cleaner, more convenient and more profitable

to you!

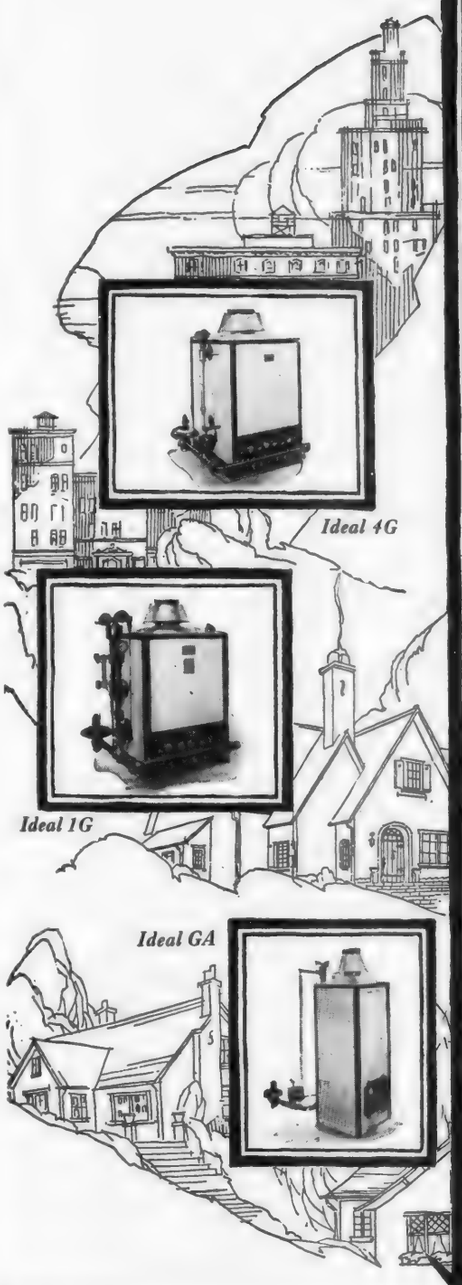
For cottages or bungalows — with or without basements — an Ideal Arcola Gas Heater!

For small or medium-sized homes — Ideal 1G Gas Boiler!

For larger homes and buildings — Ideal 4G Gas Boiler!

For office buildings, big apartment houses, hotels — Ideal 4G Gas Boilers in multiple units

All these boilers are useful for large-volume hot-water supply and industrial applications.

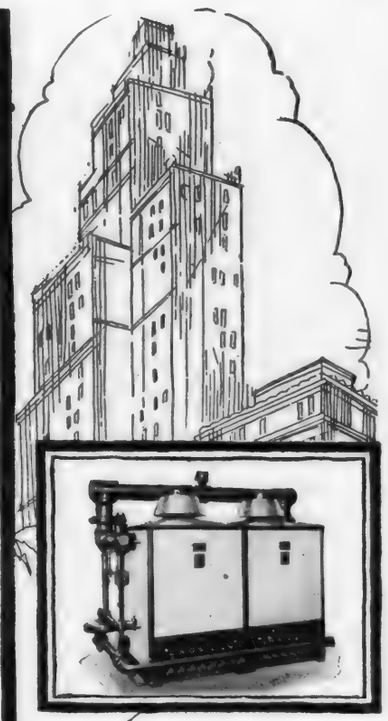


LET your better customers know what it means to live in a house automatically heated by an Ideal Gas Boiler!

More and more gas companies are establishing special rates for heating, and cooperating with contractors. This means a clean net profit for you on every job. The gas company takes care of callbacks and service.

A complete range of boilers for every heating job—from a model cottage to the largest building.

Write for details

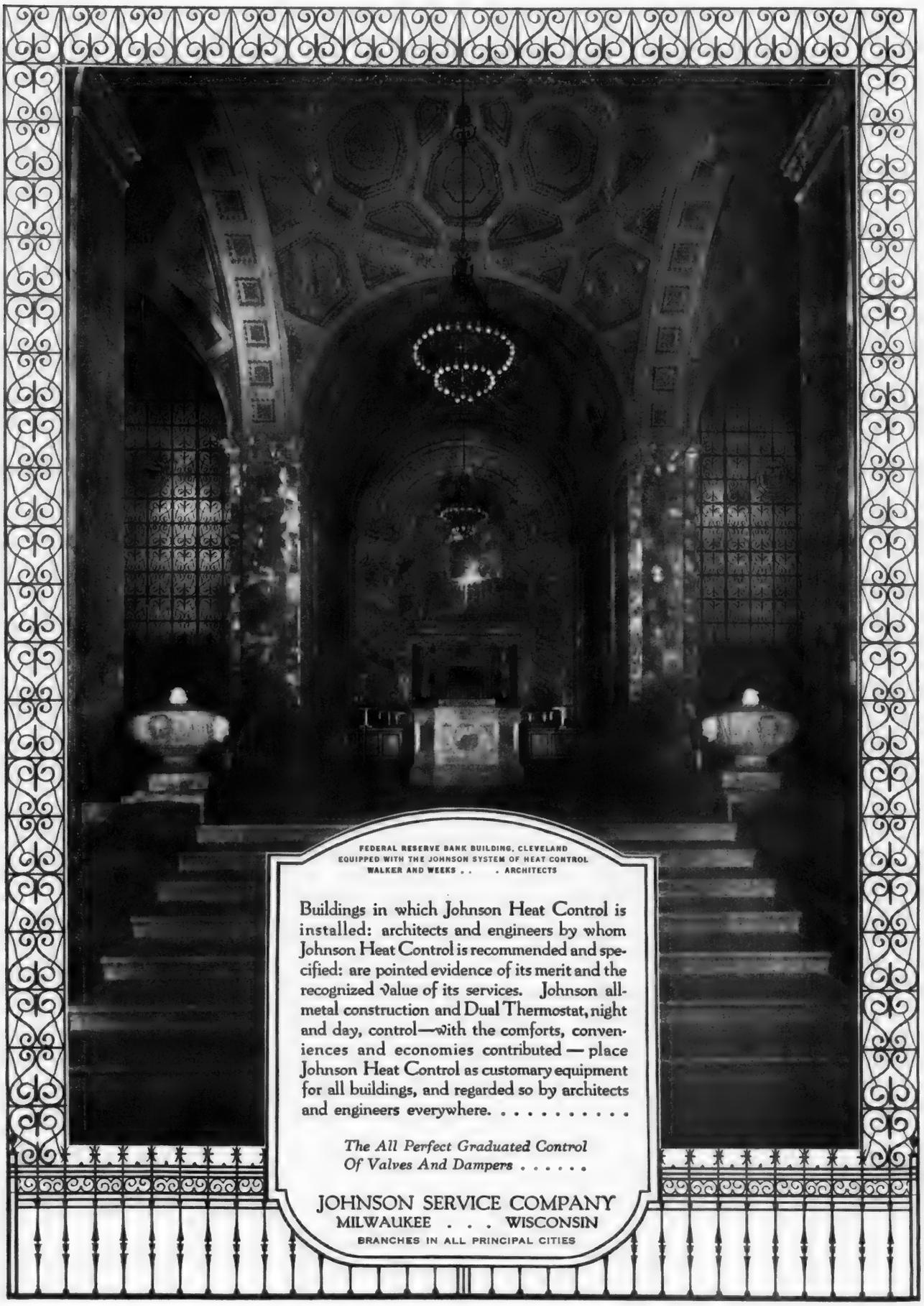


IDEAL GAS BOILERS

Product of AMERICAN RADIATOR COMPANY *Gas Utilization Dept.*

Write to AMERICAN GAS PRODUCTS CORPORATION, *Distributors*

376 Lafayette Street, New York City



FEDERAL RESERVE BANK BUILDING, CLEVELAND
EQUIPPED WITH THE JOHNSON SYSTEM OF HEAT CONTROL
WALKER AND WEEKS . . . . ARCHITECTS

Buildings in which Johnson Heat Control is installed: architects and engineers by whom Johnson Heat Control is recommended and specified: are pointed evidence of its merit and the recognized value of its services. Johnson all-metal construction and Dual Thermostat, night and day, control—with the comforts, conveniences and economies contributed — place Johnson Heat Control as customary equipment for all buildings, and regarded so by architects and engineers everywhere. . . . . .

The All Perfect Graduated Control
Of Valves And Dampers . . . . . .

JOHNSON SERVICE COMPANY
MILWAUKEE . . . WISCONSIN
BRANCHES IN ALL PRINCIPAL CITIES

PIPE TAP

Made of high carbon steel. Carefully inspected and tested. Standard taper is ¾ inch per foot. Right-hand threads always furnished unless left-hand is specified. Left-hand threads at same list, but different discount.

WALWORTH PIPE TOOLS & WRENCHES

A COMPLETE LINE FOR ALL PURPOSES

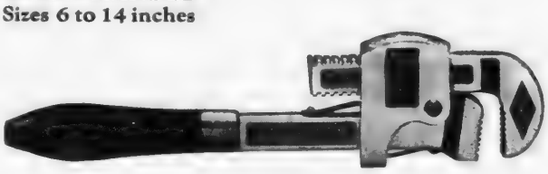
ROLLER CUTTER

Frame, swing block and handle are made of high grade malleable iron. Spindles are cold rolled steel. Wheels are made of special alloy steel, heat treated and properly hardened. Cutting edge of wheel is ground after being hardened. Pins are high carbon steel hardened. The rollers which fit against the pipe and hold the cutter in position also serve to flatten off the burr left on the pipe by the cutting edge. Made to take pipe up to three inches.

PARMELEE WRENCH

The Walworth Parmelee Wrench is especially recommended for use on brass or nickel plated pipe. Its perfect ratchet action grips like the human hand. No lost motion. Works in closest places. Makes or breaks tightest joints. No teeth —it does not chew or mar the most highly polished surface. Will make up nipples without damage to threads. Sleeve lock design for pipe up to one inch only; nut lock for all sizes up to four inches.

WOOD HANDLE
Sizes 6 to 14 inches



STEEL HANDLE
Sizes 6 to 48 inches

Walworth Master Stillson

Working with a high grade carbon steel, Walworth has produced in the new Master Stillson a superb pipe wrench, vastly stronger and tougher. Expert forgemen hammer out jaws and handles from white hot steel bars. From new annealing and heat treating furnaces, hardening pots and oil baths, the Master Stillson bars and jaws derive strength, toughness and durability far superior to even the old Walworth Stillson. And these processes, automatically controlled, assure uniformity in finished wrenches.

There has been no change in basic design, the correctness of which has been proved by millions of workmen the world over. The improvements lie in the treating of the steel, adding more than 50 per cent to the strength of the wrench. You will know the Walworth Master Stillson as genuine by the new red lacquer handle and the diamond trade-mark.

THE WRENCH WITH THE *RED* HANDLE

WALWORTH

WALWORTH INTERNATIONAL CO.
Foreign Representative. 11 Broadway, N. Y.

Distributors in Principal Cities of the World
General Sales Offices: 51 E. 42nd St., New York

WALWORTH CO., LIMITED
10 Cathcart St., Montreal, P. Q.

A Profit-Making Pair

ABC Automatic Oil Burner

YOU can *now* make money selling oil burners

ABC

the de luxe oil burner

Rich or poor, you can get them coming or going. Both the mansion and the cottage are prospects for the dealer who sells these two oil burners. The market is as vast as your ambition.

ABC is the oil burner de luxe. It is the pioneer of the rotary, in-the-ashpit method of burning oil. Now, after seven years, ABC has many imitators. But they are seven years behind! It took seven years and thousands of dollars to perfect this method of burning oil.

Don't ride in the Calliope

When you can lead the oil burner parade. Enlist ABC and Heat King and you can be the drum-major in your city.

Heat King

the burner for every man

Every man can afford the proved Heat King—the burner that is seven years ahead. And the exclusive dealer who sells ABC and Heat King has a burner for *every man.*

Heat King is made by the foremost manufacturers of rotary, in-the-ashpit burners. It is the result of seven years of experience and research. Isn't it reasonable that Heat King should be seven years in advance of the burners that are just now entering the rotary method kindergarten?

Investigate now

Detailed information will be sent you gladly. If you are interested in a profitable agency, may we suggest that you get the facts today.

MEMBER OIL HEATING INSTITUTE OIL HEAT AS DEVELOPMENT AS DEPENDABLE

AUTOMATIC BURNER CORPORATION

312 NORTH MAY STREET, CHICAGO

Now is the Time to Sell

AUTOMATIC OIL BURNER

Nu-way

FOR HOME HEATING

Automatic Oil Burners

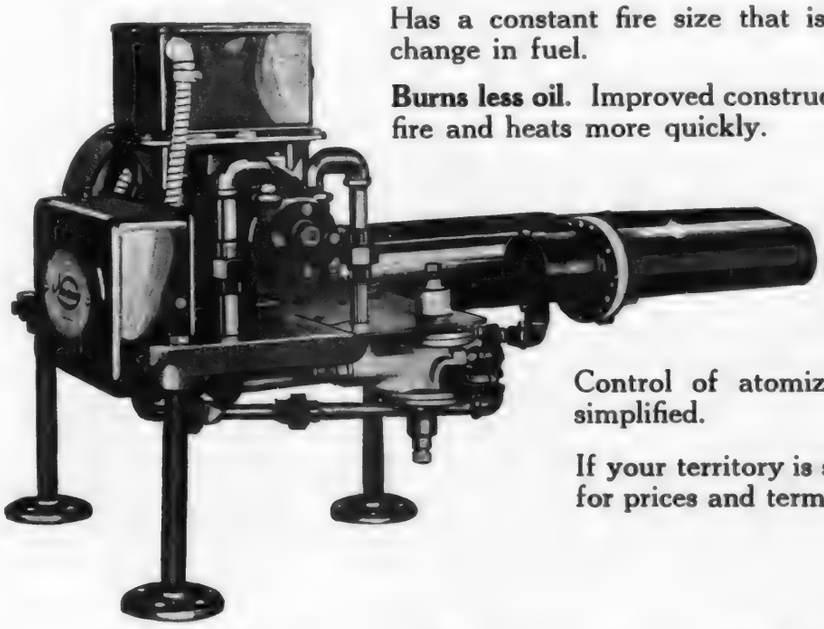
Don't wait until your prospects have put in their coal or until they actually need heat. Sell and install them now.

There are six new reasons why your prospects will appreciate the 1928 Nu-Way.

It is more quiet. A quiet fire has been developed that eliminates all flame roar.

It is more simple. The controls and supply pump, both formerly extra units, are now built into the main unit.

Has no extra pump. Both cost and installation work of an extra pump are eliminated.



Has a constant fire size that is not affected by a change in fuel.

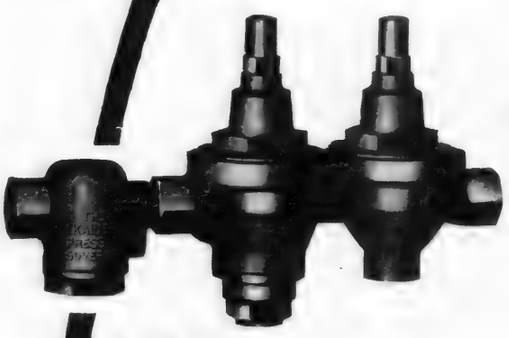
Burns less oil. Improved construction makes a hotter fire and heats more quickly.

Control of atomizer pressure greatly simplified.

If your territory is still open, write **now** for prices and terms.

The Nu-way Corporation, Rock Island, Ill.

Eliminate expansion tanks - cut installation costs with



The KAINER PRESSURE GOVERNOR

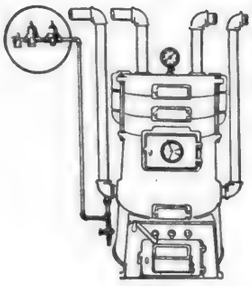
LIST PRICE
$24

For Hot Water Heating Systems

When you explain the obvious advantages of installing a KAINER PRESSURE GOVERNOR to the owners of heating plants in your community, you win their *instant respect* and *confidence.*

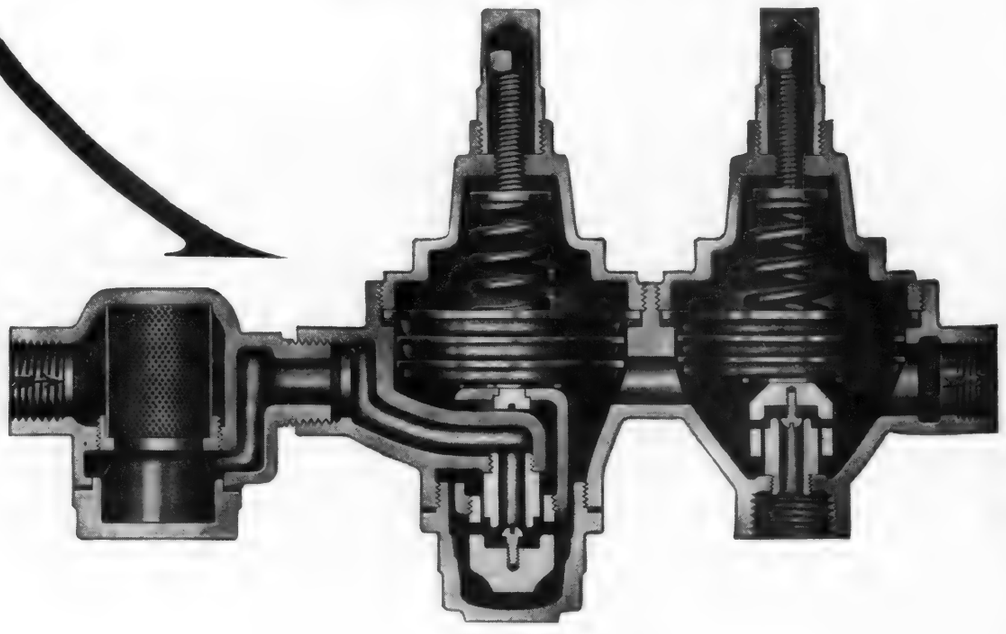
By eliminating the old style expansion tank, you save them money, make their plants less expensive to operate and greatly increase safety of operation. In addition, you make a *substantial profit* on a device that will live up to your reputation for good work.

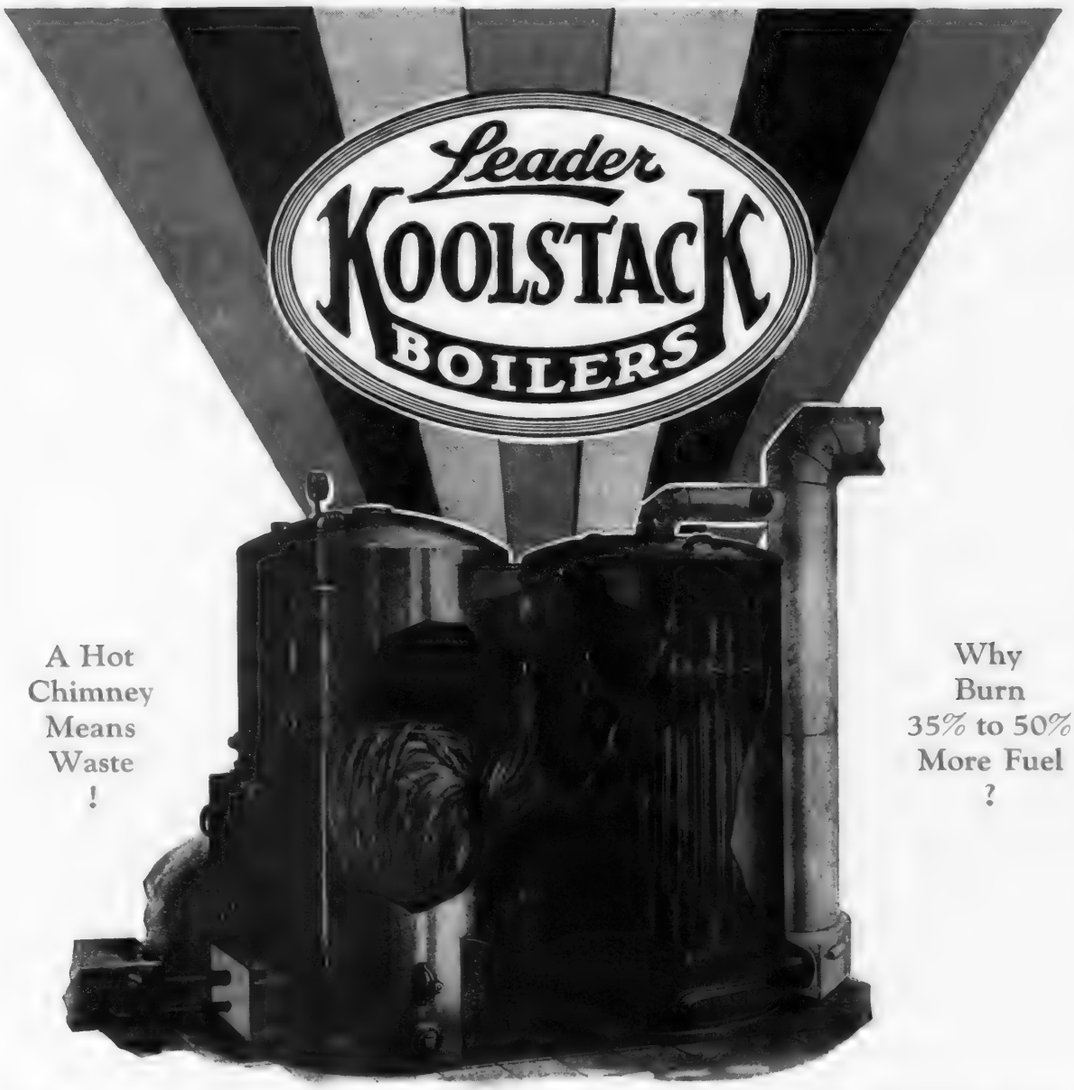
The KAINER BELLOWS DIAPHRAGM—an exclusive Kainer feature—is used in both units as shown below. It is extremely sensitive and responds instantly to the slightest pressure change. The entire governor is made of bronze—rust proof, scale proof, substantial.



Write us for full information, list prices and discount to you

KAINER & COMPANY
CHICAGO
761-763 Mather Street
Manufacturers of Plumbing and Heating Specialties





A Hot Chimney Means Waste !

Why Burn 35% to 50% More Fuel ?

KOOLSTACK Boiler for Oil Burning

ECONOMY IN OIL BURNING. When the chimney is running hot, oil bills are higher than they need be.

A HOT CHIMNEY MEANS WASTED HEAT that might have been used to warm the house. Stack temperature needs to be high enough to eliminate condensation—and no higher.

Oil Cannot Be Burned Economically in a boiler that will burn soft coal well.

KOOLSTACK BOILERS **Are Economical for Oil Burning.** These boilers have far more heating surface, and retain the products of combustion within the boiler until all the effective heat has been released.

STACK TEMPERATURES BELOW 300° F. on Koolstack Boilers reveal their secret of economy.

ADAPTABILITY. Though designed for Oil Burning, Koolstack Boilers show remarkable performance records with Coke or Anthracite Coal. They are not intended for use with soft coal.

HEATING CONTRACTORS have in the Koolstack Boiler an opportunity for greater profits—and a guarantee of more economical heating for their customers. Write for Bulletin 564.

LEADER IRON WORKS

2150 N. JASPER STREET, DECATUR, ILLINOIS

21 East 40th St., New York, N. Y.

Merely giving some news about

Kleen-Heet with Oil

YOU have probably heard a good deal of talk about new developments in the Winslow Boiler & Engineering Company's line of Kleen-Heet, and Winslow Industrial, oil burners.

The net of it is just this: *oil burner selling, servicing and profits have been put on an entirely new and modern basis.*

Yes, there is a new Kleen-Heet—Series 100, The Challenger—for small homes and purses. It taps an entirely new and hitherto untouched stratum of oil burner prospects—and sales.

Details will be sent, of course, to anyone who is seriously interested. This year's production is almost entirely allotted to our present dealers. This is printed as a piece of news possessing widespread interest among those in any way connected with the oil burner industry.

THE WINSLOW BOILER & ENGINEERING CO.

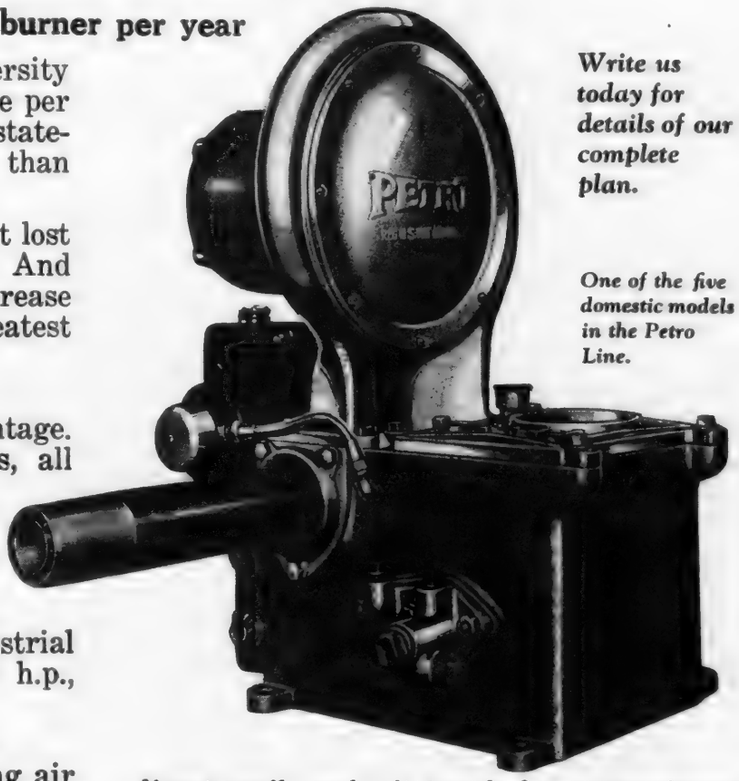
844 Rush Street, Chicago, Ill.

Petro sets new low record
for service calls per burner!

Survey shows only 1.91 calls per burner per year

A recent survey made by a State University shows that less than 2 calls were made per Petro per year. This confirms our statement that Petro requires less service than other burners.

Petro dealer profits from sales are not lost later in the season on service costs. And sales are constantly mounting. The increase over last year is 114%, with the greatest selling months still ahead.



Write us today for details of our complete plan.

One of the five domestic models in the Petro Line.

5 DOMESTIC SIZES

Petro dealers have a tremendous advantage. The line includes 5 domestic models, all fully automatic, all listed as standard by the Underwriters' Laboratories to burn oil as low as 24 gravity. Any heating plant from 200 sq. ft. steam radiation to 18,000 sq. ft. may be equipped with ONE Petro. Industrial models range from 50 h.p. to 1000 h.p., using 14 gravity oil.

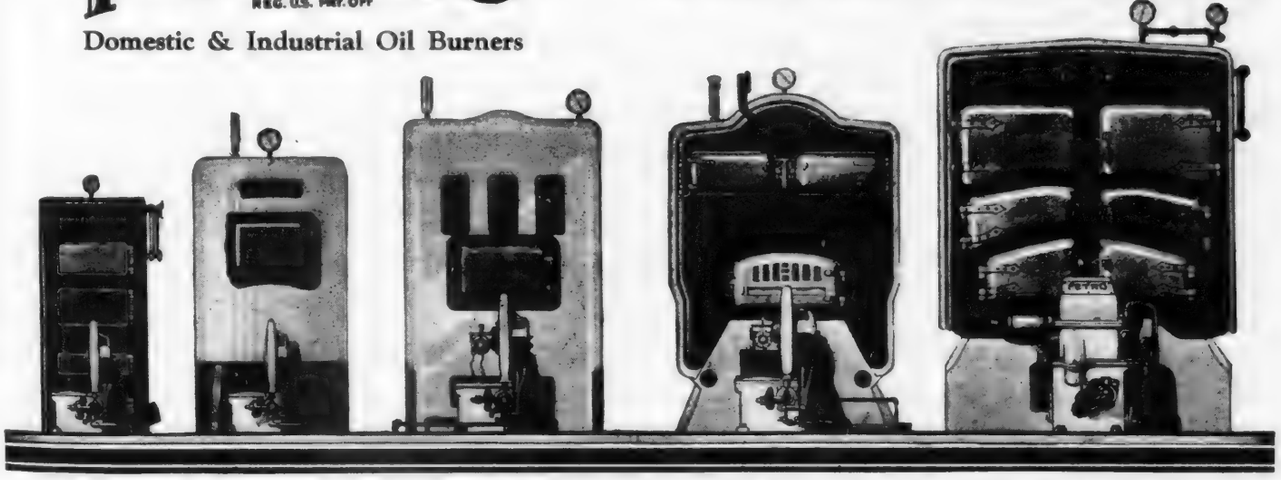
POWERFUL SALES AIDS

The new simplicity effected by making air do all the work makes it possible to absolutely guarantee Petro satisfaction and make money by it. Unusual sales helps, sales counsel, local newspaper advertising, direct mail, make it tough for competitors. More and more of the better class oil burner dealers are turning to Petro for the substantial profits that invariably follow.

PETRO
REG. U.S. PAT. OFF

Domestic & Industrial Oil Burners

PETROLEUM HEAT & POWER COMPANY
Makers of oil burners since 1903
511 Fifth Avenue, New York City
Fess System Co. (Subsidiary) 220 Natoma St., San Francisco, Calif.



LD-0 PETRO
200 sq. ft. st. rad. to 1000 sq. ft. 1 gal. to 2½ gal. per hr. ⅓ h. p. motor.

LD-1 PETRO
800 sq. ft. st. rad. to 2000 sq. ft. 2 gal. to 5 gal. per hour 1-6 h. p. motor.

LD-2 PETRO
1800 sq. ft. st. rad. to 4000 sq. ft. 5 gal. to 10 gal. per hour ¼ h. p. motor.

LD-3 PETRO
4000 sq. ft. st. rad. to 18,000 sq. ft. 10 gal. to 42 gal. per hour. 1 h. p. motor.

Liberal Profits and a Ready Market

Your Sales Opportunities are Unlimited With the Rotary Model Noiseless Nokol

$390
Retail Price

THE new Rotary model Noiseless Nokol places the advantages of automatic oil heat within the reach of the most modest home. Priced so low that your sales possibilities are absolutely unlimited . . . And the profit margin for you is most liberal!

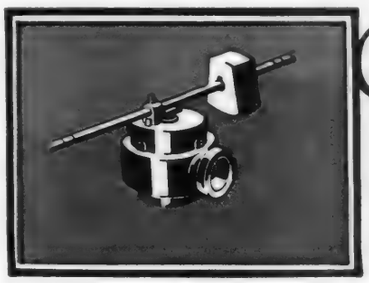
Made by the originators of automatic oil heating for homes, the new Rotary model burner has won instant popularity with both home-owners and Dealers everywhere.

Let us give you full details of the profit opportunities in our 1928 Sales, Service and Finance Plan. Gladly mailed you upon request.

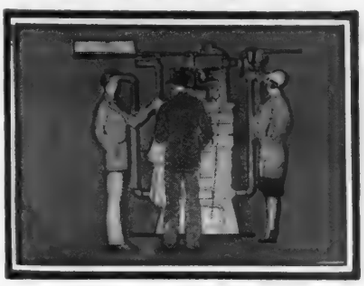
AMERICAN NOKOL CORPORATION
4226 SCHUBERT AVENUE :-: CHICAGO, ILLINOIS
World's Oldest and Soundest Automatic Oil Burner Maker

NEW **Noiseless** NO COAL **Nokol**
REG. U.S. PAT. OFF.
CLEAN AUTOMATIC OIL HEAT

All the Joys of home depend on~



A Thermostatic Temperature Damper Regulator that is complete in itself and very easy to install. Requires little attention to maintain uniform temperatures.



Your customers will tell their friends about their wonderful heating plant if you install Hot Water Heat Thrush Equipped.

A Good Heating Plant... HOT WATER HEATING THRUSH EQUIPPED

Your Customers want Comfort.

THRUSH SYSTEM makes a closed and automatically regulated job from any ordinary hot water heating plant. It may be adapted to any kind of boiler and can easily be installed on old or new plants. It will positively make any hot water heating job work better, giving increased heat transmission, quicker circulation and a saving in fuel of 20% to 40% annually. It lengthens firing periods and assures mild uniformly maintained temperatures in your customers' homes. It's the kind of product you like to sell—and selling it builds friends for you.

Use the coupon now!

THRUSH SYSTEM

OF HOT WATER HEATING

Nationally Advertised

H. A. THRUSH & CO.

PERU, INDIANA

H. A. THRUSH & CO., **Dept. A,**
Peru, Indiana ..... *19*....

Send me catalog and full information about Thrush System of Hot Water Heating

*Name*_____

Address.....

Why

prominent oil burner manufacturers *have adopted the Webster Ignition Unit*

IT is not unusual for a Webster Ignition Transformer to operate over an extremely long period of service without the need of attention . . . Its construction is one of dependable simplicity . . . It typifies ignition service developed to an unusual degree of perfection . . . So thoroughly satisfactory has the Webster proved itself under all conditions of service that it has become the unanimous choice of America's prominent oil burner manufacturers . . . Present your ignition problems to the Webster engineering staff for solution—there will be no obligation.

WEBSTER ELECTRIC COMPANY
RACINE, WISCONSIN
"Specialists in Oil Burner Ignition"

Webster Ignition Transformer

The Webster Ignition Transformer can be furnished with either single or double high tension terminals, for a variety of voltages and frequencies.

Again in the Light of the Oil Burner Flame!

Year after year, sales of Hardinge Fuel Oil Burners have shown substantial increase.

In 1927, thanks to the many satisfied users and prosperous dealers, we can point to an increase of more than 30% over 1926.

Hardinge Brothers, Inc.
Factory and General Offices:
4149 Ravenswood Ave., Chicago
Factory Branches:
Chicago, Michigan Ave. at Ohio St.
Boston, 839 Beacon St.

First the 10-year guarantee — the Hardinge really lasts a lifetime — and now —

Every Hardinge oil burner is guaranteed to heat the building in which it is installed to 70° when outside temperature is 20° below zero.

In case it does not we will remove the oil burner, return the boiler to the same condition as before and refund the purchase price of the burner to the buyer.

Wouldn't you like to know more about it?

HARDINGE

FUEL OIL HEAT - FUEL OIL HEAT - FUEL OIL HEAT

Beat that competition!

THE day is past when any oil burner salesman can have things all his own way. Present day buyers compare. But that doesn't worry the Toridheet dealer. Comparison is what sells Toridheet installations. Comparison is the best proof of Toridheet's superiority.

Noiseless • fully automatic economical • super-safe

Every Toridheet demonstration is an eye-opener to skeptical, hard-to-please prospects. Not a trace of that hum and whine found in ordinary oil burners! Dependable operation—clean combustion! The price stands comparison, too. And so does our plan for dealers. Write promptly. Exclusive territory is in demand.

Equipment is easily installed. Free from profit-stealing, time-wasting service calls. Listed as standard by the Underwriters' Laboratories. Approved by New York Board of Standards and Appeals and by Massachusetts Board of Public Safety.

CLEVELAND STEEL PRODUCTS CORPORATION
MADISON AT WEST 74th STREET CLEVELAND, OHIO

TORIDHEET
OIL BURNER
FOR BETTER HOME HEATING

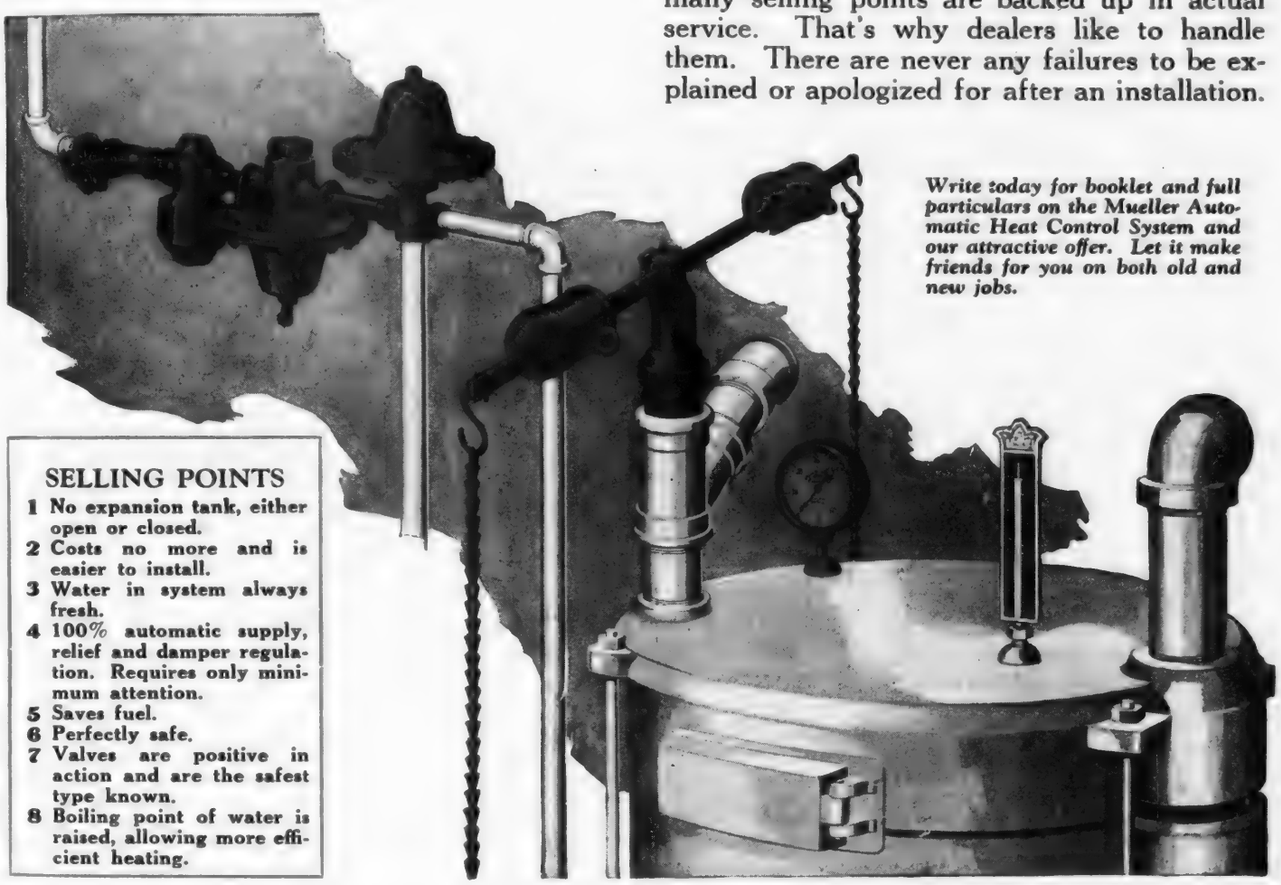
MUELLER Hot Water Heat Control

A system you'll never go wrong on

A good margin of profit and the assurance that your judgment will be backed up and your customer more than satisfied makes the Mueller Automatic Heat Control System *fair* merchandise. It is fair to you in handling and fair to your customer in service because it gives genuinely satisfactory service and after it is once installed requires practically no attention and effort on the customer's part.

It acts automatically at exactly the right moment—it maintains an even temperature and cuts down fuel costs. Dampers are opened and closed without bothering anyone and the troublesome old fashioned expansion tank is eliminated.

Mueller Automatic Heat Control Systems can be installed on new jobs or old ones. Their many selling points are backed up in actual service. That's why dealers like to handle them. There are never any failures to be explained or apologized for after an installation.



Write today for booklet and full particulars on the Mueller Automatic Heat Control System and our attractive offer. Let it make friends for you on both old and new jobs.

SELLING POINTS

1. No expansion tank, either open or closed.
2. Costs no more and is easier to install.
3. Water in system always fresh.
4. 100% automatic supply, relief and damper regulation. Requires only minimum attention.
5. Saves fuel.
6. Perfectly safe.
7. Valves are positive in action and are the safest type known.
8. Boiling point of water is raised, allowing more efficient heating.

MUELLER CO. (Established 1857) Decatur, Illinois

World's Largest Manufacturers of Plumbing Brass Goods

Branches: New York, Dallas, San Francisco, Los Angeles

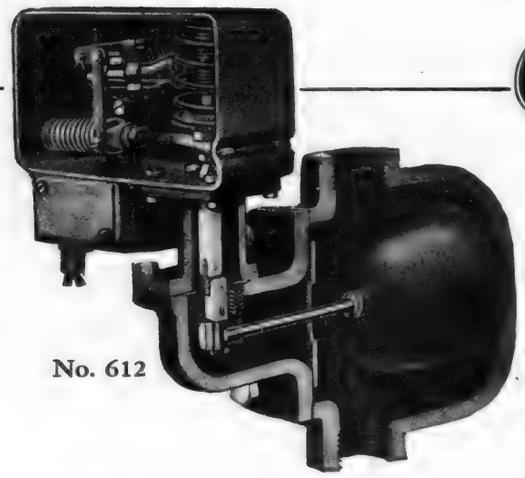
Canadian Factory: MUELLER, Limited, Sarnia

MUELLER

Automatic Heat Control System

Every Oil Burner Owner is entitled to the protection

OF THIS SAFETY CONTROL



No. 612

MERCOID

combination low water cut-out and pressure control *for* Oil Burners

THE 612 Mercoid Combination Control combines a low water cut-out and pressure control —two instruments in one—thus eliminating the cost of a separate pressure control. The 612 employs the well known Mercoid switch which carries the full line current from the motor at 110 or 220 volts. No transformer, relays or other intermediate mechanisms, subject to failure or requiring service. (Can also be furnished for three-wire low voltage control.) The design of the 612 provides that in case of damage to the float, bellows, power element or Mercoid switch, the current will be broken. Complete Safety! The pressure control range is adjustable from ½ to 9 pounds with either close or wide control. With its low price you should be able to sell this instrument for every job.

YOU can sell the Mercoid No. 612 Combination low water cut-out and pressure control for every oil-fired steam or vapor boiler installation. And you can install this instrument with complete assurance that you are giving your customer a dependable safety control.

The Mercoid No. 612 offers a much needed automatic control, for as every oil burner engineer well knows, with modern oil-burning equipment that requires no attention, owners fail to maintain a sufficient water level and costly damage to boilers often results.

To prevent firing a dry boiler the National Fire Prevention Association recommends that an automatic control be part of the equipment on all oil-burner installations. Mercoid 612 is listed as standard by the Underwriters Laboratories.

A broad line of Mercoid instruments is available for the control of temperature pressure or vacuum; for Oil Burners, Unit Heaters, blowers, refrigeration and an almost unlimited variety of other industrial applications.

Write today for detailed data and illustrated literature on Mercoid Controls.

AMERICAN RADIATOR COMPANY

40 West 40th Street ACCESSORIES DIVISION, DEPARTMENT M 78 New York, N. Y.

Makers of IDEAL *Boilers,* AMERICAN *Radiators,* ARCO *Tank Heaters,* VENTO *Ventilating Heaters,* AIRID *Air Valves,* MERCOID *Controls and devices for drying, humidifying, cooling and refrigeration*

A NEW CONCEPTION
of how dependable an oil burner can be

KNOW ELECTROL BY THE HOMES IT HEATS
Residence of Dr. E. S. Ingersoll, 26 S Goodman St., Rochester, N. Y.

THE records of Electrol performance in homes and buildings of all types and sizes will give you a new conception of how dependable an oil burner can be.

Electrol keeps right on, through one heating season after another, producing a surprising volume of heat without waste of fuel, maintaining any desired temperature regardless of severe weather or sudden changes. Service calls on Electrol average 2.3 per burner per year.

Here is oil heat at its best. Seldom the need for adjustment or regulation. Requires practically no attention whatever. Quiet . . . All-Electric . . . Entirely Automatic . . . Economical. Electrol is the oil burner with The Master Control, an exclusive device which stands watch at the furnace door, safeguarding comfort day and night.

A Good Burner To Recommend

Heating and ventilating engineers can recommend Electrol to their clientele secure in the knowledge that the burner will live up to expectations.

Electrol is built right to begin with. It is shipped to the dealer completely assembled just as it passes its final rigid factory test and inspection. And it is installed by men who have been thoroughly trained by the factory in the correct methods of fitting the burner to every type of heating plant.

Wherever Electrol is sold you will find a complete automatic oil heating service backed by a sound, large and growing manufacturing organization, and embracing (1) regulation and adjustment service constantly available and (2) candid and conscientious statement covering the possibilities of Electrol for the particular job.

The Electrol dealer will recommend the installation of the burner only after he has determined that it will operate with complete satisfaction in the existing heating system.

Profitable Arrangements For You

You can make working arrangements with the Electrol Sales and Service Representative in your locality whereby you can co-operate with him to your mutual benefit and advantage. Any Electrol dealer will be glad to explain the details of this offer and to show you how you can profit by working together.

Send for literature and information on this finer oil burner and let us put you in touch with our nearest dealer. No obligation involved, of course—and a talk with him may open a new source of income for you.

ELECTROL INC. *of* MISSOURI
177 Dorcas St. St. Louis, U. S. A.

A Size for Every Job

Electrol is made in three sizes. The Model TJ has a range from 200 to 800 square feet of steam radiation, including piping and risers or equivalent. Model T, from 600 to 3000 square feet of steam radiation. Model TD from 2000 to 8000 square feet of steam radiation

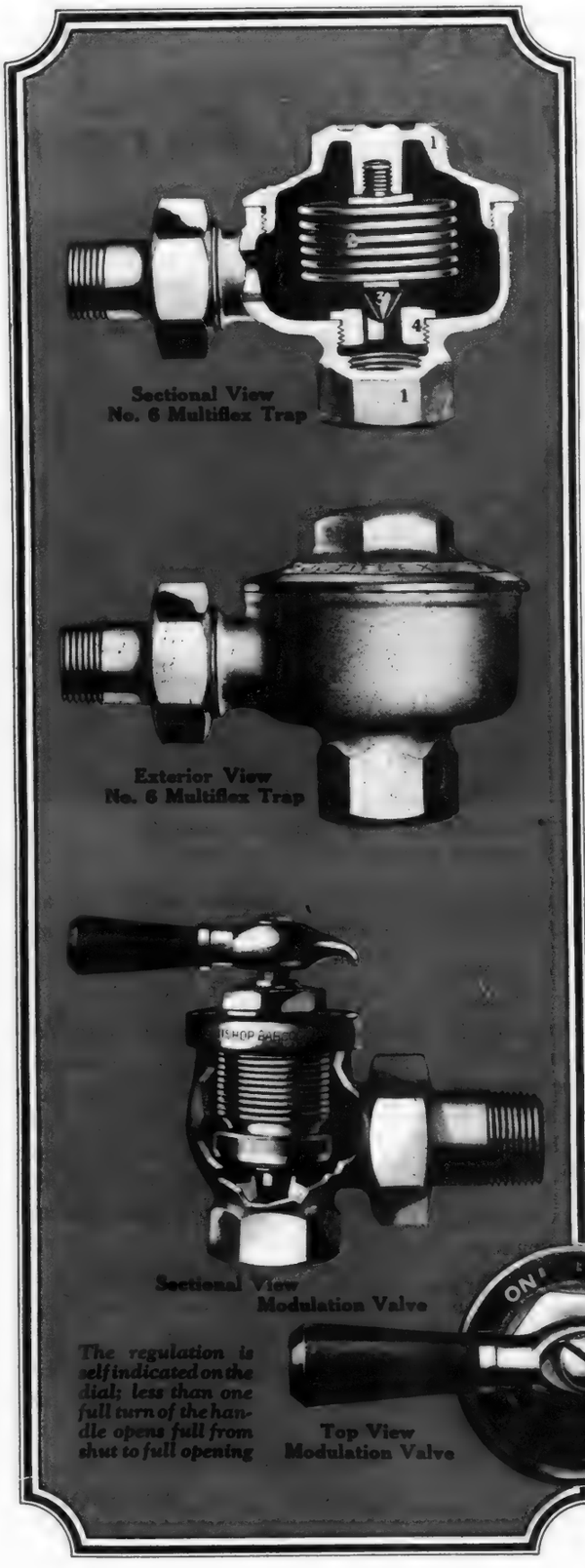
An Opportunity for Profit

Without any investment whatever, you can make money selling Electrols. Let us or the Electrol dealer in your city give you full particulars.

ELECTROL
The OIL BURNER with *The Master Control*

Listed as Standard by the Underwriters' Laboratories, and bears their label
Member of the Oil Heating Institute

Electrol Inc. *of* Missouri,
177 Dorcas St., St. Louis
Gentlemen: Please send complete details of Electrol Oil Burner ☐ Who is your nearest dealer. ☐
Name.....
Address.....
City.....State.....


Sectional View
No. 6 Multiflex Trap
Exterior View
No. 6 Multiflex Trap
Sectional View
Modulation Valve
The regulation is self indicated on the dial; less than one full turn of the handle opens full from shut to full opening
ON
Top View
Modulation Valve

An Ideal Combination

The Bishop & Babcock bellows type radiator trap and bellows inlet valve are made with all interchangeable parts and are insured an indefinite life by the use of seamless Multiflex bellows, manufactured in our own plant. Both are tried and proven articles, and behind them is the experience of many years of one of the largest companies engaged in this line of business.

These valves are typical of the thoroughness with which we have engineered our line for many years in the direction of both simplicity and efficiency.

The Bishop & Babcock Line comprises Vacuum and Vapor low pressure Heating Specialties; a complete system of Automatic Temperature and Humidity Control; Massachusetts Squirrel Cage Fans, Air Washers and Unit Heaters.

Architects and Engineers who standardize on Bishop & Babcock Apparatus insure uniformity in design and operation not to be found in equipment of varied manufacture.

THE BISHOP & BABCOCK SALES CO.
General Offices 4901-4915 Hamilton Ave., N.E.
CLEVELAND, OHIO
Branches and Representatives in Principal Cities

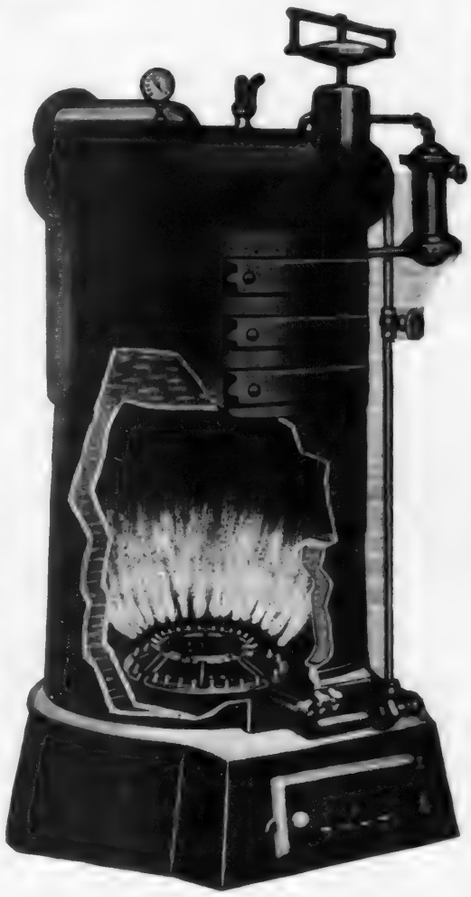
BISHOP & BABCOCK
TEMPERATURE REGULATION
HEATING SPECIALTIES VENTILATING EQUIPMENT

Retire the Shovel—
But Use the Boiler or Furnace!

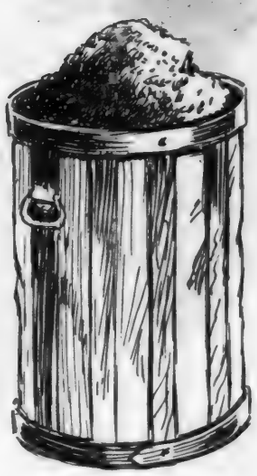
BARBER Patented JET GAS BURNERS

Will retire thousands of coal shovels and ash cans during the next few months. The good old coal-burning boiler or furnace will remain —but will be modernized and brought up-to-date—converted into a clean, automatic, efficient, and economical gas heater with Barber CONVERSION Burners.

There's a rich harvest waiting for wide awake heating men that will go right out after this most profitable business. Start now—don't delay! Get our Demonstrating Outfit, Display Signs, Circulars, Broadsides, Consumer's Letters, etc., and begin your Sales Campaign at once. Write us to-day.



Illustrating the No. 3-R-17 Barber Burner properly positioned in a round boiler. The same idea is carried out in a round warm air furnace; that is, by placing the burner low in the fire-box, the longest possible heat travel is obtained. Barber CONVERSION Burners are furnished in sizes and capacities for every house heating need.



The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3702-04 Superior Avenue, Cleveland, Ohio

SUPPORTING MEMBER

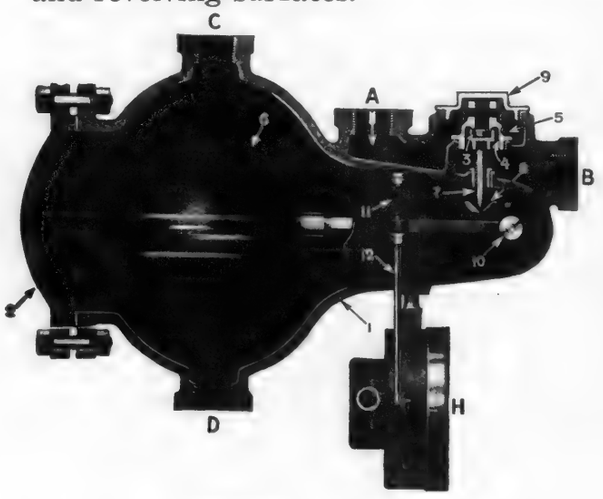
COMPANY MEMBER OF AMERICAN GAS ASSOCIATION

Insure Constant Boiler Water Supply!

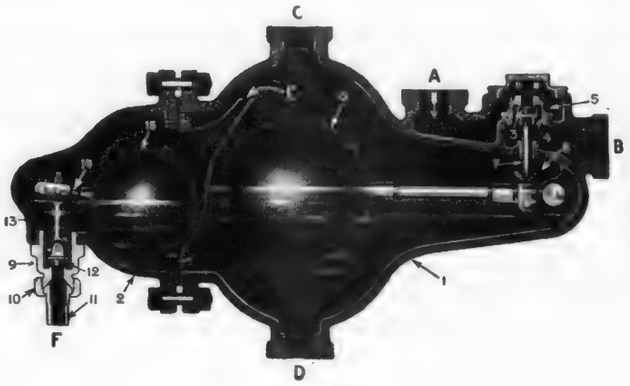
Install McALEAR Water Feeders

McAlear Water Feeders supply water "Direct to Boiler." Automatically maintain a constant and positive water level. Work with unfailing dependability on large and small capacity coal and oil fired boilers. Nearly 10,000 installations—all giving satisfactory service plus.

The corrosion-proof feeder valve of the McALEAR never wears out; its free moving action eliminates all rubbing and revolving surfaces.



McAlear
Simplex Feeder
with low water cut-out switch
No. 836



McAlear
Duplex Feeder
No. 826

The McALEAR No. 826 Duplex Water Feeder automatically supplies water "Direct-to-Boiler" and also discharges any surplus water into the sewer, which results in their maintaining a constant and positive water level.

Double protection for oil burner installations No. 836 McALEAR Simplex Feeder with low water cut-out switch—two protections in one unit, each works independently. Feeds water and shuts off oil burner before any damage is done, should some unforeseen event cause low water in the boiler.

McALEAR builds water feeders for coal, oil, and gas fired boilers.

Write for latest bulletin.

19th and Western

McALEAR Manufacturing Company

Chicago, Illinois

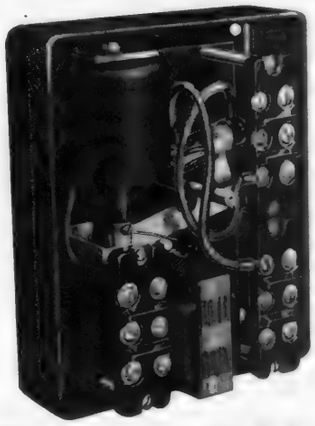
CON-TAC-TOR

DON'T OVERLOOK THESE NEW CONTROLS in selling UNIT HEATERS

The No. 135 Thermoswitch and The No. 112 Magnetic Relay

This combination will so regulate the operation of a Unit Heater that room temperatures will not vary more than one degree. That is real control and it won't cost you a fortune either. For single phase control, this combination lists at $27.50 and for 3 phase at $32.00. Furthermore these prices are arranged to provide profit to the dealer.

No. 135 Thermoswitch



No. 112 Magnetic Relay

CON-TAC-TOR
Elkhart, Indiana.
Gentlemen—

Your ad in the August H. & V. interests me. You may send me:

☐ Full information and discounts.

☐ A trial set of Controls which I may return for refund if unsatisfactory.

Name .....

Address .....

ABSOLUTE CON-TAC-TOR CORPORATION

ELKHART INDIANA

MERCOID
AUTOMATIC CONTROL
FOR STEAM BOILERS

PAT. ISSUED
1521638
1598874
1640869
1658013
OTHERS PEND.

Figure 31

MERCOID
PRESSURE CONTROL

The Mercoid Automatic Pressure Type Control, here illustrated, is a positive safety limiting device for all steam units. It is widely used as a boiler control with automatic oil burners and automatic coal-burning equipment.

Standard Range: 1 lb. to 4 lbs. Adjustable up to 7 lbs. to 10 lbs. Other ranges available.

No relay or starting switch is necessary where the normal working loads do not exceed 10 amperes at 110 volts or 5 amperes at 220 volts, A.C. or D.C.

As a pilot switch, where used in series with the proper starting switch, the Mercoid will automatically control motors of the largest size.

Can be furnished for semi-automatic operation to cut out on either a rise or drop in pressure, as specified, equipped with manual re-set for resuming operation.

Write for Combined Pressure and Low Water Control and Vapor Vacuum Control Bulletin No. 70

MERCOID
AUTOMATIC CONTROL FOR VAPOR-VACUUM

The Mercoid Immersion Type Back Angle Control, illustrated herewith, is particularly adapted for positive control on vapor-vacuum systems, with special range 200° to 214° F., adjustable up to 214° to 226° F., for installation below the water line.

Furnished fully automatic, or when so specified, semi-automatic with hand re-set.

For direct control where the normal working loads do not exceed 10 amperes at 110 volts or 5 amperes at 220 volts.

Mercoid Controls Are Available for Both High and Low Voltage

Figure 37

PAT. ISSUED
1521638
1598874
1640869
1658013
OTHERS PEND.

MERCOID
IMMERSION TYPE CONTROL

THE MERCOID CORPORATION

564 W. ADAMS STREET
CHICAGO, ILL.

25 CHURCH STREET
NEW YORK, N. Y.

Why ..... only the best duplex feeder is good enough...

A HEATING CONTRACTOR told us recently that he considered it possible to have McDonnell & Miller protection without paying the McDonnell & Miller price. He didn't question the superiority of the new self-cleaning feeder, but he asserted that the feeder was better than is necessary for "ordinary" operation.

Our answer is that just as long as the boiler water line depends on human memory any emergency is likely to arise . . . sometime. It follows that unless a duplex feeder is equal to *any* emergency, it is *worse than none.*

You pay a little more for the new self-cleaning McDonnell & Miller, but your dollars buy *continuous* feeder service—nothing less is worth buying.

To overcome the effects of rank feed water it was necessary to design valves that clean and grind themselves during every movement of the float. To provide capacity sufficient to supply the entire feed-water requirements of boilers of any size, even though the condensation pump ceased to operate, it was necessary to work out a method of putting the full city pressure into the boiler feed line.

And finally, to make the feeder easy to install and to adjust, it was necessary to provide a method of changing the water line one inch higher or lower *after* the installation is made and also for adjusting the differential between supply and overflow valves.

Such a feeder is *worthy* of your confidence—a fact that has been written into the records of every boiler room in which the new feeder has been installed.

Booklet brings facts and data

Simply mail the coupon for an interesting booklet which contains facts that every engineer and heating contractor should have.

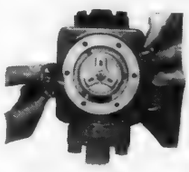
McDonnell & Miller, 710 Wrigley Bldg., Chicago

McDONNELL & MILLER

SELF-CLEANING

Duplex Feeder

"Doing one thing well"



The valves that stay new

The rotary valve, shown above, cleans and grinds its surfaces each time the float moves. The valve disc can be easily removed from the shaft and changed to any of the three positions indicated by the numerals. The three positions of the feed-water supply valve provide for changing the water line an inch up or down after the feeder is installed. By changing the relation between the overflow and supply valves, the differential may be set at 1, 2, 3, 4 and 5 inches.

A large accessible strainer

To make the feeder still more positive, a large solderless strainer is provided which can be quickly and conveniently removed as shown opposite.

YES I WANT THE NEW BOOKLET

Firm_____

Individual_____

Street and Number_____

City and State_____

Mail to McDonnell & Miller, 710 Wrigley Bldg., Chicago H&V-8

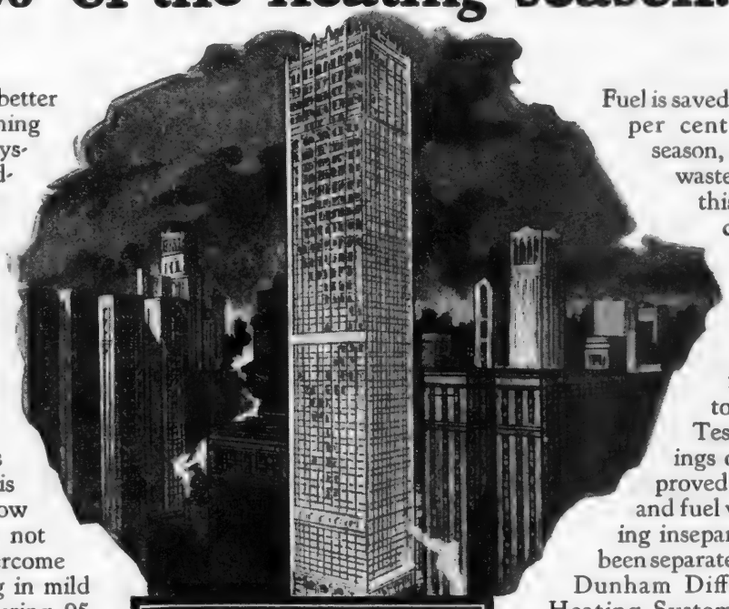
When is a heating system obsolete?

Ans: When it overheats during 95% of the heating season.

THERE IS a new and better standard for determining whether or not a heating system is obsolete. This standard came into existence with the advent (January, 1927) of the Dunham Differential Vacuum Heating System.

Until this new system of heating utilizing sub-atmospheric steam (steam at very low temperature) was placed on the market, all steam heating systems stood upon a fairly equal basis of comparison. No matter how efficient they might prove, not one was able to wholly overcome the problem of overheating in mild weather. Consequently, during 95 per cent of the heating season all of these systems wasted heat. According to Government Weather Bureau records, maximum heat output, contemplated by the design basis of the heating system, is required on an average of but 5 per cent of the days of the entire heating season.

Today, in this newest and most revolutionary achievement (the Dunham Differential Vacuum Heating System) pressures at or above atmosphere are done away with during mild weather. As a result, overheating and its twin brother, wasteful window opening, are eliminated.



The Barlum Tower

Detroit, Mich.

USING Edison Central Station Steam Heating service, the Barlum Tower during the heating season, September 12, 1927 — June 5, 1928, operated on the remarkably low consumption of

292.08 pounds of steam per sq. ft. of active radiation (48,000 sq. ft. installed, 40,800 active).
2684 pounds of steam per 1000 cubic ft. of total cubage.
39.624 pounds of steam per sq. ft. of rentable floor area.

Fuel is saved during ninety-five per cent of the heating season, instead of being wasted. The amount of this saving, on fuel-cost records kept by those who have installed this Dunham Heating System, has ranged from 20 per cent to 40 per cent.

Tests in typical buildings of every sort have proved that heat comfort and fuel waste, far from being inseparable, should have been separated years ago. In the Dunham Differential Vacuum Heating System they are being kept far apart in hundreds of structures with most gratifying success. For example, Detroit's new 40 story skyscraper, the Barlum Tower, is distinctive not only because of its great height, but also because its heating system does not overheat.

Why specify or install fuel-wasting systems of heating when the Dunham Differential Vacuum Heating System, under many tests of service in buildings from the 40 story office structure to modern business and factory installations has proved its high efficiency and economy.

Look for the Name DUNHAM

U. S. Patent No. 1644114. Additional patents in the United States, Canada and Foreign Countries now pending.

C. A. DUNHAM CO.

DUNHAM BUILDING *450 East Ohio Street* CHICAGO

Over eighty branch and local sales offices in the United States, Canada, and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.

Brass Tube Annealing is Brought to an Exact Science by this Latest and Largest of Furnaces

EVERY TUBING PART

Copper, Aluminum, Brass

A growth of nearly 300% in five years is a definite tribute to the efficiency of our Tube Drawing and Tube Fabricating Departments. Whatever your tubing problem—it can be answered here in a way which will lead you to consider us as your permanent source of supply. Send your specifications or blue prints for quotations.

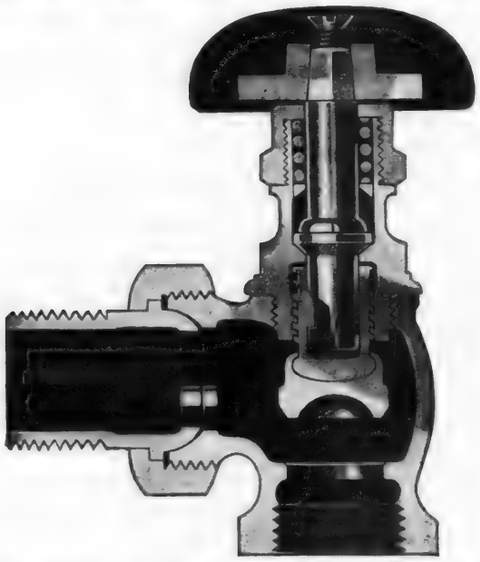
WOLVERINE TUBE CO.

SEAMLESS COPPER BRASS & ALUMINUM

1415 Central Ave., Detroit, Michigan

Sales Offices: Cleveland; Chicago; Atlanta; Los Angeles; Denver; Rochester, N. Y.; Dayton, Ohio; New York City; Dallas, Texas.

Marsh Re-enforced PACKLESS WATER Radiator Valves



Oval Wheel
or
Lock Shield

Fig. 137

These valves are quick opening, full pipe capacity, and are GUARANTEED NOT TO STICK AT ANY TIME, OR LEAK AT ANY PRESSURE that a cast iron boiler and radiation will stand.

We believe they are the only Packless valves which will hold high pressure forced circulation and also protect against taking in of air around stem in a sealed system, *two very necessary requirements* for satisfactory service and cost no more than the cheap competition valves. Get our prices.

Marsh Re-enforced GRADUATED WATER Radiator Valves

Fig. 139

Oval Wheel,
Lever Handle
or
Lock Shield

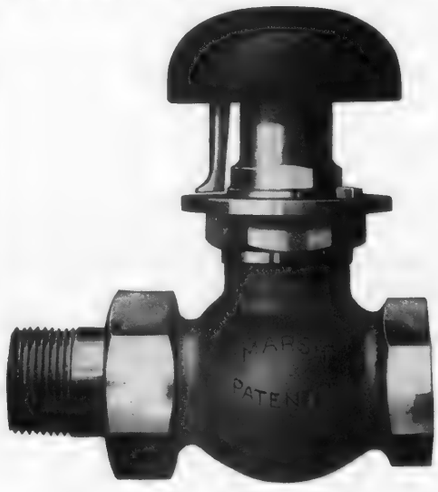


Fig. 239

With these GRADUATED Valves we regulate water heat temperature THROUGH VALVE, the same as for a vapor or vacuum steam system through a Modulating Valve. These are not only of material value for residence service, but we have thousands in use for high pressure service in schools, hospitals and public buildings.

These valves cost but little more than our regular water valves and much less than steam modulated valves.

MARSH VALVE COMPANY

DUNKIRK **NEW YORK**

General Sale Distributors

Edward T. Hetherington
1709 Sansom St., Philadelphia

Appleton & Liptrott, Inc.
1480 Broadway, New York

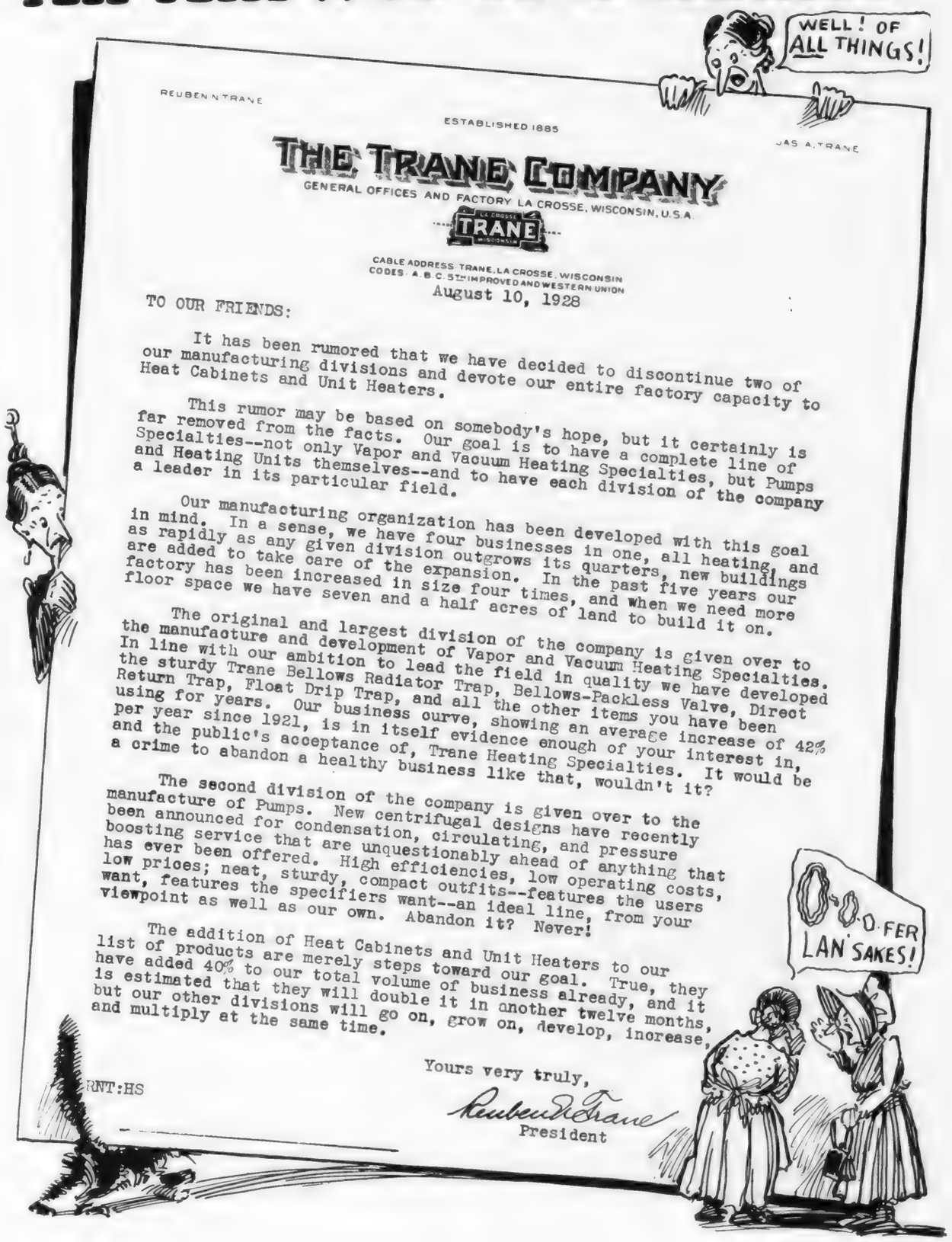
John W. Mabbs
431 So. Dearborn St., Chicago, Ill.

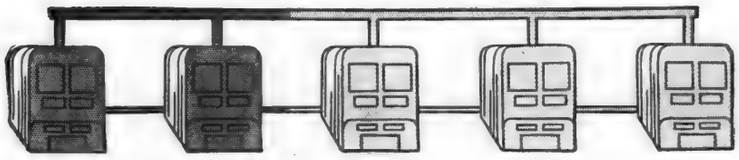
United States Radiator Corp'n
General Offices: Detroit, Mich.

SARCO COMPANY, Inc.
183 Madison Ave., New York

Taylor-Forbes Company
Canadian Agents Guelph, Ont.

An Answer to a Rumor


WELL! OF ALL THINGS!
REUBEN N. TRANE
ESTABLISHED 1885
JAS. A. TRANE
THE TRANE COMPANY
GENERAL OFFICES AND FACTORY LA CROSSE, WISCONSIN, U.S.A.
TRANE
CABLE ADDRESS: TRANE, LA CROSSE, WISCONSIN
CODES: A.B.C. 5TH IMPROVED AND WESTERN UNION
August 10, 1928
TO OUR FRIENDS:
It has been rumored that we have decided to discontinue two of our manufacturing divisions and devote our entire factory capacity to Heat Cabinets and Unit Heaters.
This rumor may be based on somebody's hope, but it certainly is far removed from the facts. Our goal is to have a complete line of Specialties--not only Vapor and Vacuum Heating Specialties, but Pumps and Heating Units themselves--and to have each division of the company a leader in its particular field.
Our manufacturing organization has been developed with this goal in mind. In a sense, we have four businesses in one, all heating, and as rapidly as any given division outgrows its quarters, new buildings are added to take care of the expansion. In the past five years our factory has been increased in size four times, and when we need more floor space we have seven and a half acres of land to build it on.
The original and largest division of the company is given over to the manufacture and development of Vapor and Vacuum Heating Specialties. In line with our ambition to lead the field in quality we have developed the sturdy Trane Bellows Radiator Trap, Bellows-Packless Valve, Direct Return Trap, Float Drip Trap, and all the other items you have been using for years. Our business curve, showing an average increase of 42% per year since 1921, is in itself evidence enough of your interest in, and the public's acceptance of, Trane Heating Specialties. It would be a crime to abandon a healthy business like that, wouldn't it?
The second division of the company is given over to the manufacture of Pumps. New centrifugal designs have recently been announced for condensation, circulating, and pressure boosting service that are unquestionably ahead of anything that has ever been offered. High efficiencies, low operating costs, low prices; neat, sturdy, compact outfits--features the users want, features the specifiers want--an ideal line, from your viewpoint as well as our own. Abandon it? Never!
The addition of Heat Cabinets and Unit Heaters to our list of products are merely steps toward our goal. True, they have added 40% to our total volume of business already, and it is estimated that they will double it in another twelve months, but our other divisions will go on, grow on, develop, increase, and multiply at the same time.
Yours very truly,
Reuben N. Trane
President
RNT:HS
O-O-O-FER LAN' SAKES!



2 Boilers now do the work of 5

Modernization saves $17,696.00 yearly

IN Chicago, five 400 H.P. boilers were eating up $37,350 worth of coal annually in an unsuccessful attempt to heat a group of buildings* connected to the power plant. Heating-up took two hours, repairs were unending and the pressures maintained were excessive.

Realizing the extravagance and inefficiency of this obsolete system, the Building Manager called in Webster steam heating specialists. As a result the entire layout was modernized . . . converted into an efficient Webster Vacuum System of Steam Heating.

Then what happened?

A recent survey made by an impartial engineer shows that since this system was modernized in 1925 two boilers have replaced the original five, 4600 tons of coal are burned instead of 8300, the building is heated up quickly at very low pressures, repairs are now non-existent, and the net annual return on their investment is 50.5%—sufficient to retire the entire cost of modernization in two years!

*** Name of installation on request**

- since 1888

Webster Systems of Steam Heating

WARREN WEBSTER & COMPANY - Camden, New Jersey
Pioneers of the Vacuum System of Steam Heating
52 U. S. Branch Offices—*In Canada, Darling Bros., Ltd., Montreal*

More than 46,000 installations in America's finer buildings

WARREN WEBSTER & COMPANY, Camden, New Jersey HVM-8-28
We would like to read about the money saved by "Modernization" of Obsolete Heating Plants.

Name..... Title.....

Address.....

Making a Change to Webster Well Worth While

The heating paraphenalia of this particular group of buildings scarcely merited the name "system." It was originally intended to be of the vacuum type, requiring only a few pounds' pressure, but due to the combination of small supply and return mains, excessive number of turns, long distances and depreciated equipment, it was necessary to use 10 to 20 lbs. at the radiators and up to 100 lbs. on the mains to reach distant radiators.

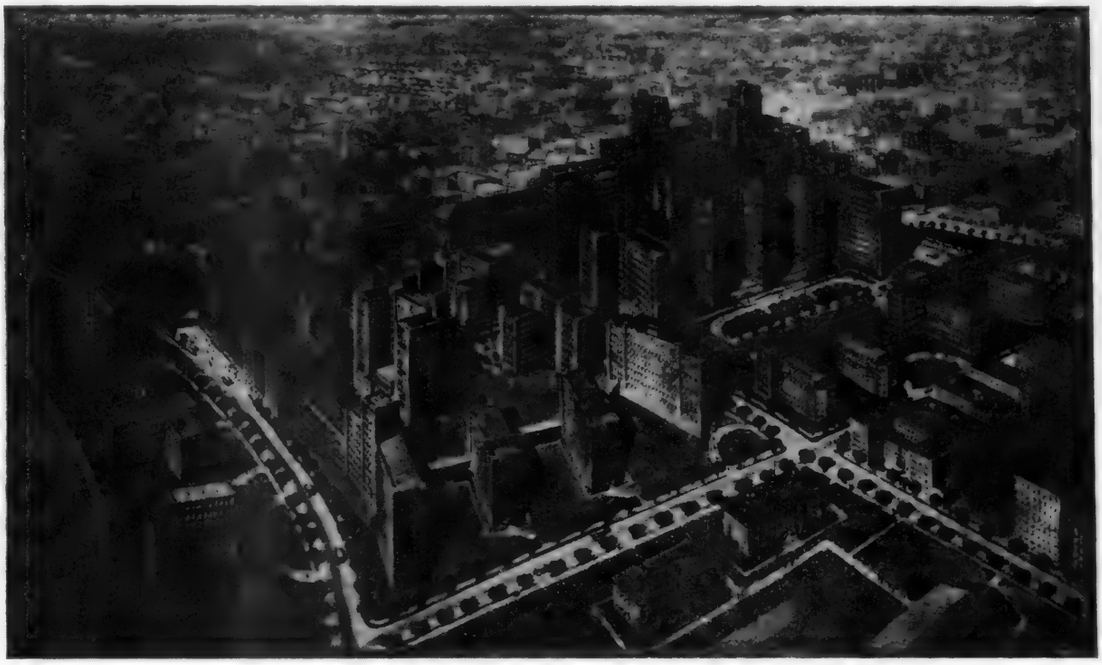
Even at this pressure was it impossible to heat up the building in less than two hours, and water-hammer was a prevailing nuisance. Furthermore, the high pressures on boilers and piping caused frequent leaks, damage to floors and provided steady work for two steam fitters throughout the winter months.

After several years of complaints and extravagances steam heating specialists from the local Warren Webster & Company branch office were called in to make a survey to determine what was needed to obtain maximum results without excessive reconstruction cost. Their suggestions covered specific changes in piping layout, the installation of Webster Sylphon Traps on radiators, Webster Heavy Duty Traps on risers and new motor-driven Vacuum pumps. It was also decided to separate the boiler plant, generating high pressure in one small boiler for process needs and low-pressure steam for heating in two others.

The result of these changes and modifications was an agreeable surprise to the owners. Now—only 30 to 45 minutes are required to bring the buildings to working temperature, noisy radiators and expensive repairs are noticeably absent, and perfect control is maintained over the entire building area. As to economies—the saving in fuel alone amounts to $16,500 annually. In repairs and boiler room labor $2,500. And in ash cartage $1,000—a total net saving of $17,696.00 per year.

KIELEY

For Pressure Control



The Medical Center
New York City

Architect—
J. Gamble Rogers
Engineers—
Werner Nygren
Heating Contractors
Baker Smith & Co.
T. F. Hall, Inc.
Gillis & Geoghegan
E. Rutzler Co.

THE Reliability of Kieley Specialties is proved in their acceptance by leading Architects and Engineers for the largest projects.

The Medical Center when entirely completed will be the largest group of Hospital Buildings in the world.

Kieley & Mueller Pressure Reducing Valves and other Specialties form part of the Mechanical Equipment.

KIELEY & MUELLER, Inc.

34 West 13th Street **New York City**

Owen, Sayler & Payson, Architects
MacMahon Co., Heating Contractors

American Blower Co., Fan Heating Apparatus
Photo by Anderson Photo Co., Kansas City

Shrine Temple, Kansas City, Mo., heated by Aerofin

AEROFIN

has broadened Fan Engineering

not only, but the

AEROFIN CORPORATION

cooperates to make certain that

Aerofin Installations function successfully

Five years ago, when Aerofin, the pioneer non-corrosive Fan System Heating Surface, was first offered, it immediately broadened the whole scope of Fan Engineering because its compactness, light weight and *encased unit* construction made practicable design and location hitherto impracticable.

But not content with providing the means of advancement alone, the Surface itself, the Aerofin Corporation has unremittingly cooperated with the most brilliant Architects, Engineers and Contractors in America to develop the best principles of its application to the constantly widening requirements of today,—a selfless policy which is intended to insure to the whole Profession the maximum advantage of the Surface itself.

Bulletin No. 8, Low Pressure Aerofin, 64 pgs. in 4 colors, including 18 *proved* Piping Diagrams, and/or Bulletin No. H.P.-2, High Pressure Aerofin, containing large Temperature Effects Chart on linen, will be sent gratis upon request.

Whatever you've wished for in a Fan System Heat-Transfer Surface you'll find in Aerofin!

AEROFIN CORPORATION

Burnham Building
CHICAGO

750 Frelinghuysen Avenue, NEWARK, N. J.
39 Cortlandt Street, NEW YORK

Oliver Building
PITTSBURGH

LOW PRESSURE
AEROFIN
For pressures up to 50 lbs.
Tube-plate Construction

[*Aerofin is sold only by Manufacturers of nationally advertised Fan Heating Apparatus*]

HIGH PRESSURE
AEROFIN
For pressures from 25 to 350 lbs
Continuous Seamless Tubes

Are you overlooking this opportunity to sell hundreds of ARCO *water regulators?*

ARCO Water Regulator No. 800

IDEAL Redflash Water Boilers are equipped with automatic damper control. This is convincing proof that a good water regulator is essential to modern hot water heating efficiency.

But in your territory there are unlimited sales opportunities for the Arco Water Regulator. Many new boilers are installed every year without automatic damper controls and in addition there are hundreds of old boilers in your community without this essential accessory.

Every one of the Arco boilers installed within the last ten years, should mean a sale, for they are especially provided with a two-inch tapping for an Arco Water Regulator. This allows an easy installation and the cost to the owner is merely the price of the regulator plus a small labor charge.

When you are called into a home to make a health examination or to do repair work, be on the lookout for these extra sales. The additional Water Regulator business you can do in this way will surprise you.

Owners will quickly and gladly pay a few dollars for this automatic damper control. In fact, they will be grateful when you show them how the Arco 800 will not only cut their fuel bills, but will relieve them of chasing up and down the basement stairs to adjust drafts. Such comfort and convenience coupled with economy is what the modern home owner is looking for.

Extra Profits Also in the ARCO Steam Regulator No. 905

And when you are called in to replace a worn out rubber diaphragm in a steam regulator, you have an opportunity to sell an Arco Steam Regulator No. 905. All you need do is tell the owner how a rubber diaphragm soon loses its efficiency and finally within a short time must *again* be replaced. You can easily sell a 905. It is a genuine economy—for the diaphragm is metal and will last throughout the life of the boiler.

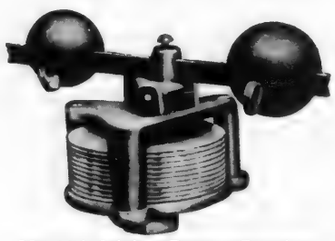
ARCO Steam Regulator No. 905

AMERICAN RADIATOR COMPANY

40 West 40th Street ACCESSORIES DIVISION, DEPARTMENT W R 78 New York, N. Y.

Makers of ARCO *Packless Valves,* ARCO *Damper Regulators,* AIRID *Air Valves,* MERCOID *Controls,* IDEAL *Boilers,* AMERICAN *Radiators,* ARCO *Tank Heaters,* VENTO *Ventilating Heaters, and devices for drying, humidifying, cooling and refrigeration.*

Fifteen Years Ago The Fulton Sylphon Company Introduced Accurate Automatic Damper Regulation



No. 924, Sylphon Damper Regulator
Extra Sensitive.

No. 22-J. Sylphon Damper Regulator
For low pressure steam boilers with light dampers.

SYLPHON Damper Regulators built around the Sylphon Bellows, *a one piece seamless, solderless, flexible and durable diaphragm* solved for all time the problem of efficient checking and increasing drafts in proportion to steam pressure or water temperature.

Their appearance marked the passing of the old style damper regulators with their faulty diaphragms. *Flat rubber discs* deteriorated or changed form. *Flat metal* or corrugated discs broke and even when new had a slight snap action. *Built up diaphragms* leaked or broke at the soldered edges.

Sylphon Damper Regulators Prevent Fuel Waste and Save Fuel Costs

The owner of the towering hotel, apartment, office building or modest home, who studies the scientific action and the care and wear proof construction of Sylphon Damper Regulators, will be quickly convinced.

Thirty-five manufacturers of boilers, long ago made Sylphon Damper Regulators standard equipment. They have been successfully used on hundreds of thousands of heating plants and are specified generally as the most reliable.

There is a Sylphon Damper Regulator for Every Steam, Hot Water or Vapor Heating Plant

Send for fully illustrated and descriptive literature covering the various Sylphon Damper Regulators, their construction and installation.

The Original and Only Genuine
SYLPHON BELLOWS

The motor element in all Sylphon Instruments is the most accurate, durable and flexible temperature control unit known to science.

THE FULTON SYLPHON COMPANY, *Knoxville, Tenn., U. S. A.*

Sales Offices: **New York, Chicago, Philadelphia, Boston, Detroit. All Principal Cities in the U. S.** DEPT. W

Gentlemen:
We are interested in Sylphon Damper Regulation for

Name _____

Company _____

Address _____

City _____ State _____

THE FULTON SYLPHON COMPANY
Sylphon
AUTOMATIC TEMPERATURE CONTROL

a Complete Heating system~

for any type or size of installation from One Manufacturer

REGARDLESS of size or type of heating installation—the Milwaukee Valve Company has systems and specialities that work economically and efficiently.

Heating engineers and contractors know from experience that they can build prestige and make profits with Milvaco equipment. One manufacturer—one guarantee, means satisfaction to all.

For 27 years the Milwaukee Valve Company has also been specializing in the manufacture of the unexcelled line of "Milwaukee" standard brass valves, packed type radiator valves, gate, globe, angle, check valves, etc

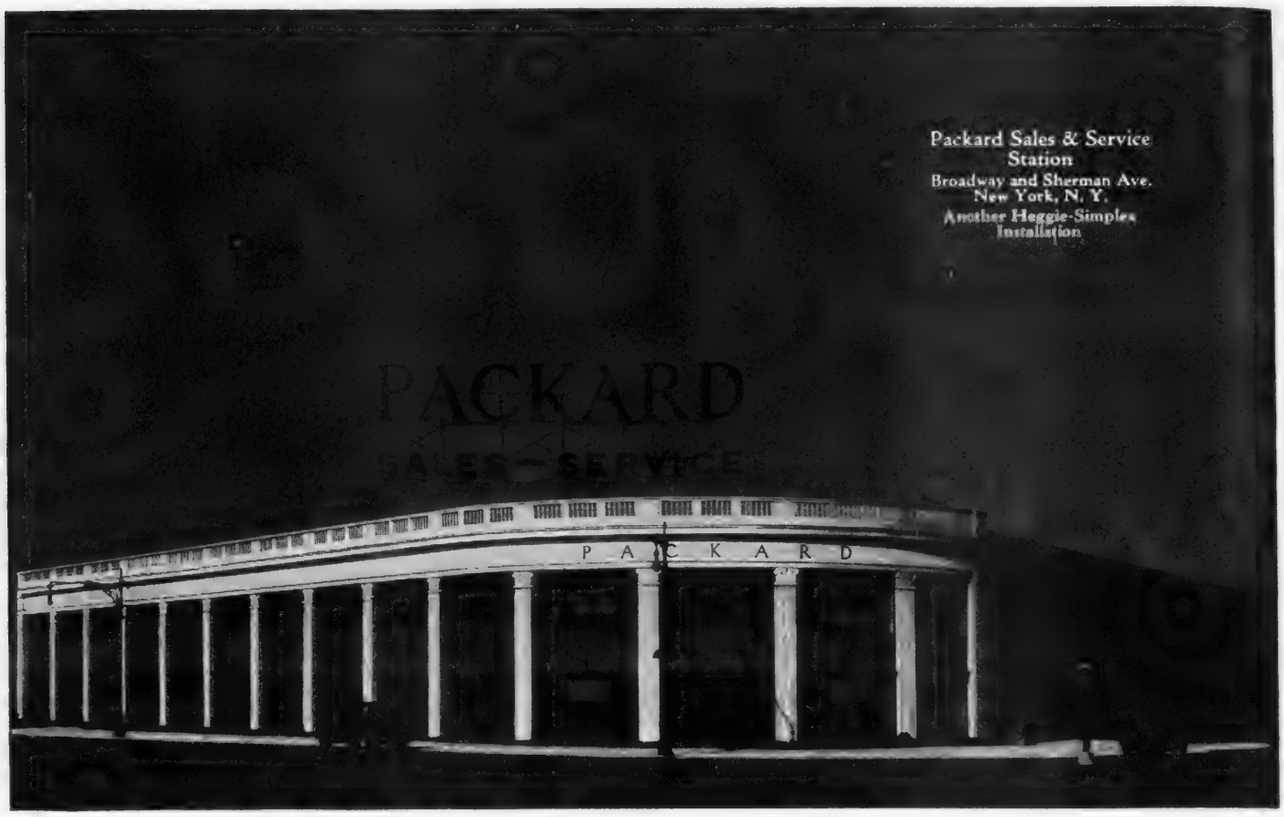
Write for complete information

Dept. B

MILWAUKEE VALVE CO.

MILWAUKEE, WISCONSIN

OFFICES IN ALL PRINCIPAL CITIES



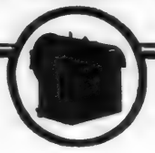
As Careful to Get Value As to Give It

AMERICA'S leading corporations have reached outstanding success through strict insistance on value not only in what they have to sell but in everything they buy. In boiler equipment an ever increasing number of these leaders is turning to Heggie-Simplex for reliable low-cost performance. The savings which they gained are available for your business too. Investigate this most modern of heating boilers today!

Heggie-Simplex Boiler Co., Joliet, Illinois. Representatives in principal cities —telephone and address listed under "Heggie-Simplex Boiler Company."

HEGGIE-SIMPLEX

ELECTRIC-WELDED STEEL HEATING BOILERS



The Heating & Ventilating Magazine

Volume XXV

Reg. U. S. Pat. Off.
Reg. Canadian Pat. and Copr't Off.

Number 8

Contents of previous issues of THE HEATING AND VENTILATING MAGAZINE *can be found by consulting the Industrial Arts Index at the nearest library.*

Contents for August, 1928

Heating the Summer White House.....*Konrad Meier* **53**
Cedar Island Lodge, in Northern Wisconsin, with Supplementary Buildings, Supplied with Heat from Central Water Heating Plant.

Gas Heating for the Heating Contractor.....*G. C. Carnahan* **58**
Part III—The Middle-West Has Large Natural Gas Areas and Many Cities Where the Use of Manufactured Gas for Heating Is Increasing Rapidly.

Some Thoughts on the Technique of Heating.....*F. P. Elliott* **62**
Are We Following the Wrong Idea in Heating the Air in Our Homes?

Air Conditioning in a Movie Theatre..... **64**
Description of Simplified Arrangement as Used in a New Brooklyn Playhouse.

Replacing the Old Heating Plant.....*David B. Hayes* **67**
Part II—Installing Radiators in an Old Home Frequently Becomes a Compromise Between Locating Them Where They Belong and Finding Less Desirable Locations.

Tubular Electric Heating System Used in Great Britain..*A. C. Blackall* **70**

Heating and Ventilation Specifications.....*Harold L. Alt* **72**
Part V—Verbal Instructions, Patents, Fees and Charges, etc.

An Analysis of Domestic Oil-Burner Fires..... **77**
Study Made by National Board of Fire Underwriters.

Welding as Applied to Steam and Water Piping.....*John H. Zink* **80**
Elementary Considerations of Cost, Technique and Standardization.

How Would You Do It?..... **83**

Health and Ventilation.....*Peter H. Bryce, M.D.* **84**
6. Ventilation of Passenger Coaches.

Legal Decisions..... **87**

Fundamentals for the Oil-Burner Dealer..... **88**

Correspondence..... **89**
Proper Connections to Radiators Located Below the Steam Main.
Best Location for Air Valve on Tube Radiation.
Offsetting Body Heat Output.
Wall Temperatures During Heating-Up Period.

American Society of Heating and Ventilating Engineers..... **91**
Methods of Air Distribution.
Development of Gas Heating for Homes.
Method of Calculating Cost of Gas Heating.
Operating Data on Federal Buildings.
Coefficients of Heat Transfer as Measured Under Natural Weather Conditions

Unit Heaters Show Economy in Large One-Story Factory..... **97**

Present Practice in Vapor Heating..... **100**
15. The Veco System.

Standard Heating and Ventilating Data Sheets..... **90A**
No. 48J and No. 48K—Oil Burning—Oil Fuel Specifications (Continued).

Engineers' Specification Index, Page 178.

Advertisers' Index, Page 186.

YEARLY SUBSCRIPTION $2.00 **SINGLE COPIES, 30 CENTS**

Published monthly at 386 Fourth Avenue, New York, by The Heating and Ventilating Magazine Company.

Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

Copyright, 1928, by Heating and Ventilating Magazine Co.

Books

ONE of our ambitions, now being realized, is the building up of a library of representative works, both old and modern, relating to heating and ventilation. Among the rare books which recently have come into our possession are the following:

A Practical Treatise on Ventilation, by Morrill Wyman, Boston, 1846.

Ventilation of Dwelling Houses and the Utilization of Waste Heat From Open Fireplaces, by Frederick Edwards, Jr., London, 1868.

Uses and Abuses of Air, by John H. Griscom, M.D., New York, 1854.

The Best Method of Warming and Ventilating Houses, by Charles Sylvester, London, 1821.

The Combustion of Coal and the Prevention of Smoke, by C. Wye Williams, London, 1858.

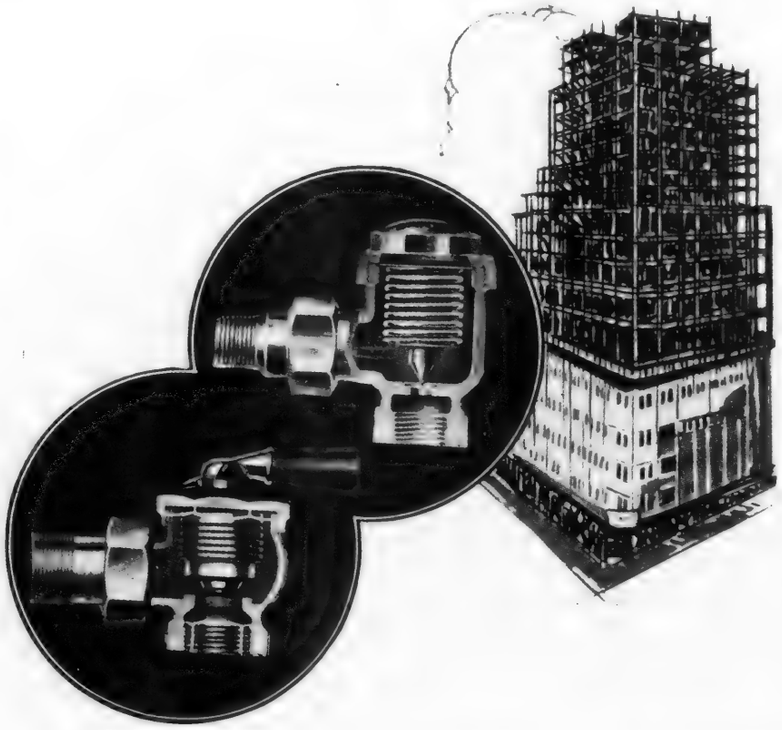
A Practical Treatise on Heat, by Thomas Box, Philadelphia, 1869.

Heat As a Mode of Motion, by John Tyndall, London, 1863.

While devices and equipment of this period were unbelievably crude, there is no discounting the grasp, displayed by many of the early writers, of the principles involved in the science of thermodynamics.

Our readers are invited to drop in and look over these volumes at their leisure.

G. V. Almquist



Wherever Important Buildings Go Up.... SARCO TRAPS *Go In!!*

YEARS ago, when we first started making Sarco Radiator Traps and Packless Inlet Valves, we had to tackle every engineer on every new building and prove with engineering facts that the Sarco were superior to any other make.

Today it's different. For thousands upon thousands of these Traps and Valves have been installed and are proving their own case in actual operation. Today most engineers and architects know Sarco features.

They know that Sarco Radiator Traps are usually long lived due to the helical expansion element; that they have a perfectly free discharge at all times; that they are noiseless, won't freeze, air bind or water hammer.

They know, too, that the Sarco Inlet Valve is a *true packless* supply valve, without any packing; that it operates by a three-quarter turn of the handle and that the pressure is always even, smooth and regular.

Yes, most well informed engineers know these features, and so today, whenever important buildings go up, the chances are that Sarco Traps and Valves go in.

All features of these modern units described in our Booklets P-110 and P-155. We'll be glad to send copies.

Sarco Co., Inc. 183 Madison Ave. New York, N. Y.

Boston Buffalo Chicago Cleveland Detroit Philadelphia Pittsburgh St. Louis

Peacock Bros., Montreal

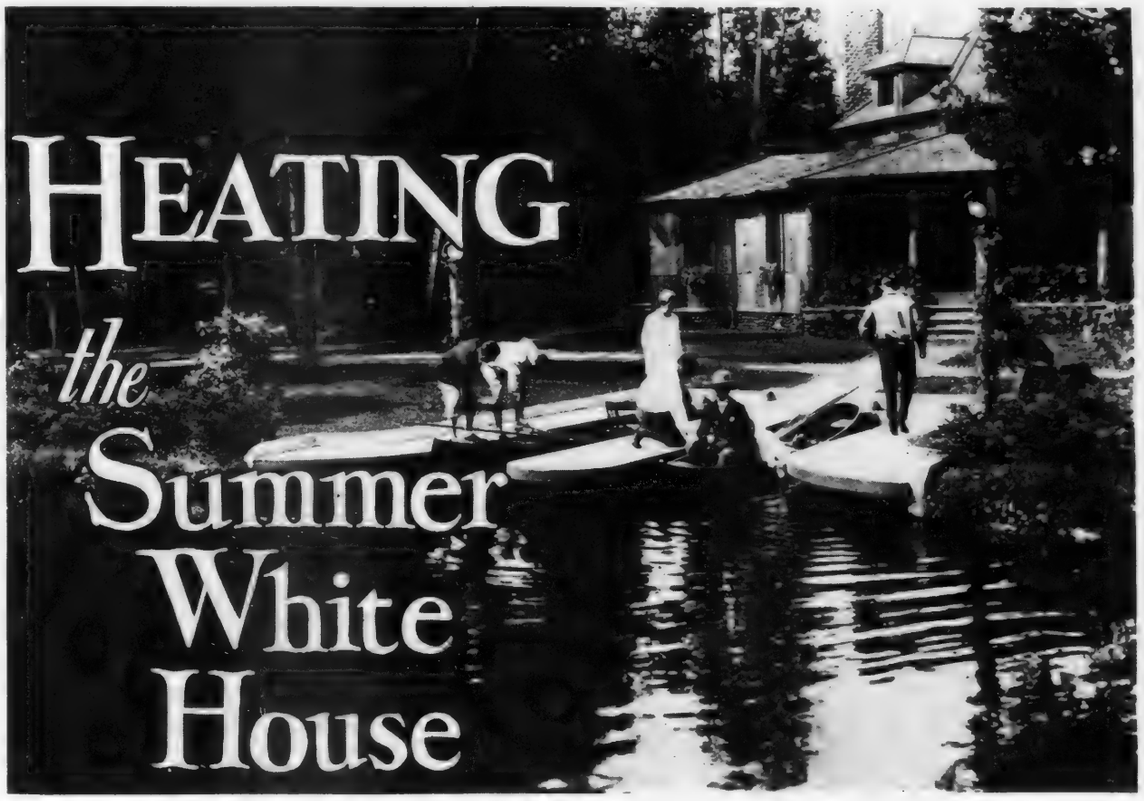
SARCO Radiator Traps and Inlet Valves

A Good Heating System

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

The Heating & Ventilating Magazine

Volume XXV AUGUST—1928 Number 8



Wide World Photo

Cedar Island Lodge, in Northern Wisconsin, with Supplementary Buildings, Supplied with Heat from Central Water Heating Plant that Has Given Satisfactory Service for Nearly a Quarter-Century.

By Konrad Meier

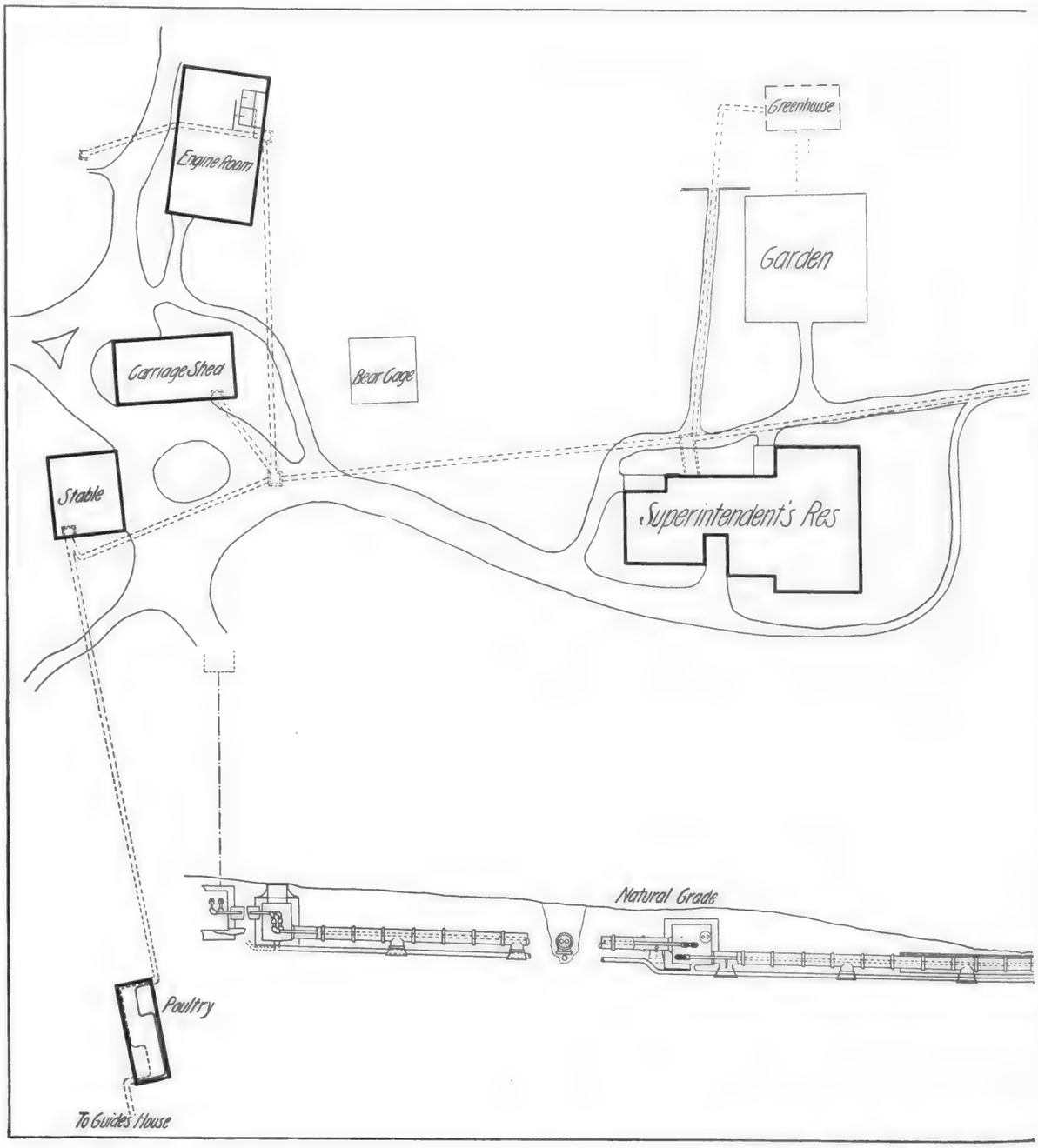
CEDAR Island Lodge, the estate of the late Henry Clay Pierce, at Brule River, Wis., comprises a large tract of land, which was acquired in a state of devastation. Thanks to the owner's ideas of conservation it has practically been restored to its natural and productive condition. It was in pursuance of this policy, that the central heating plant suggested itself, although not with the idea of saving wood, which grows in abundance around the place and would have been by far the cheapest fuel in that location. The principal reason lay in the danger from sparks from numerous chimneys, which was not to be ignored.

Under these conditions the use of coal-fired boil-

ers seemed justified, although the fuel was carted over rough roads for a considerable distance at the time when the installation was made. This, by the way, was over 20 years ago, when oil burners had not yet made their appearance. Of course, the fire risk to the wooden buildings themselves also was minimized and the plant became a decided convenience in other ways. At moderate expense the chill can be kept out of the rooms, thus making them ready for service at short notice and with little care. It also was expected that more comfort could be secured with an efficient plant of this kind, considering the very severe cold in that section and in view of the other modern conveniences provided. Indeed, this case may be regarded as a typical instance, where the ever-discussed economy in operation is quite subordinate to factors of safety and of superior service. As a matter of fact, the latter is nearly always of greater importance and should receive more attention generally.

The Heating Demand

As the service was to be restricted to the heating needs, the central plant for the somewhat scattered group of buildings assumed the simplest possible form. It consists, essentially, of two No. 4 14-section Mills boilers, each rated at 5500 sq. ft. (water), and two Buffalo centrifugal pumps for circulating the water, each rated to deliver 110 gal.



Layout of Grounds and Buildings of the Late Henry Clay Pierce, Now

per min. against a friction head of 15 lbs. per sq. in.

A Venturi manometer is connected in the main flow-line from the boilers, and is calibrated to give the rate of flow in the circulating system. A hydraulic draft-regulator operates on the ash-pit doors and check-drafts in such a manner as to maintain the desired temperature in the flow pipes.

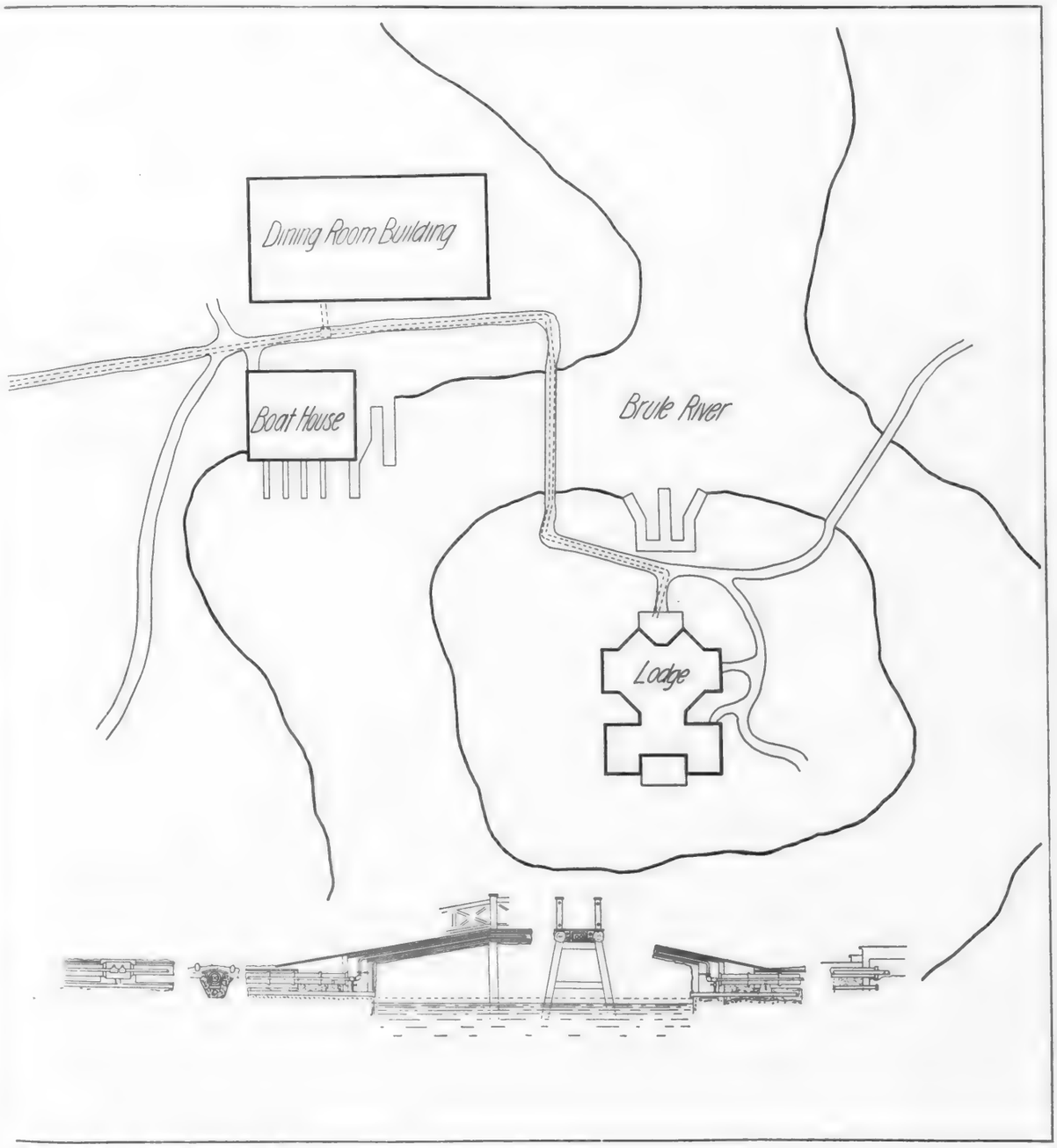
The buildings heated from this central plant are: The Lodge, the dining-room house (in which the house servants sleep), the superintendent's house, greenhouse, cow barn, horse stable, carriage shed, and carpenter shop, poultry house and the guides' house.

In the Lodge, standing radiation aggregates 800 sq. ft., in the dining-room house, 2200 sq. ft., and in the other buildings lesser amounts. The distance from the boilers to the Lodge is 800 ft., and to the dining room building is 600 ft.

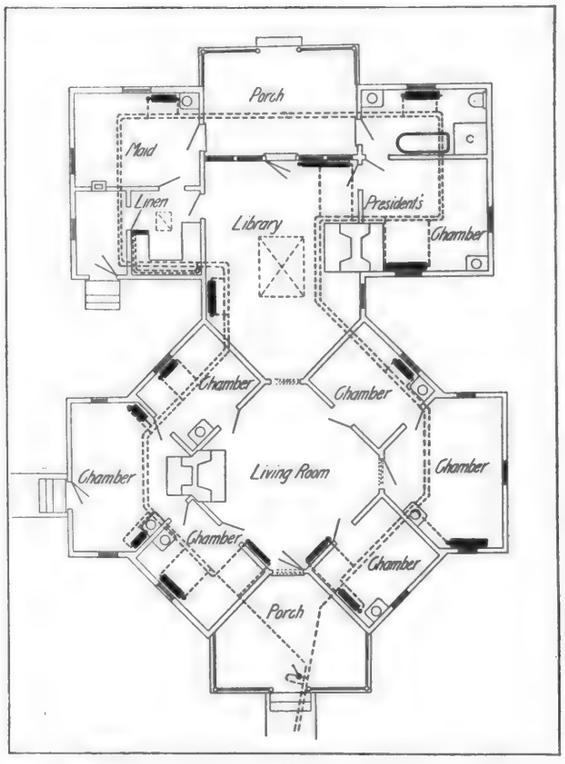
Water heating was desired because of the facility in regulation and the mild effect which would be specially appreciated at certain seasons. But this system also was decidedly preferable here for reasons of distribution.

Factors Influencing the Design of the Distribution System

The main buildings are situated on low ground, close to the river, and there would have been considerable difficulty in disposing of the condensation



at Cedar Island Lodge, the Estate Used as the Summer White House



Floor Plan of the Summer White House Showing the Arrangement of Radiation and Piping

from steam lines owing to the unfavorable grades and to the fact that deep trenches were not practicable. Also, it did not seem advisable to depend on traps and similar apparatus in view of the extreme temperature conditions. It appeared safer to rely on water circulated by pumps in the manner indicated, although the conduits had to be kept close to the surface, since the equipment within the buildings and outside of the station thereby is reduced to the minimum.

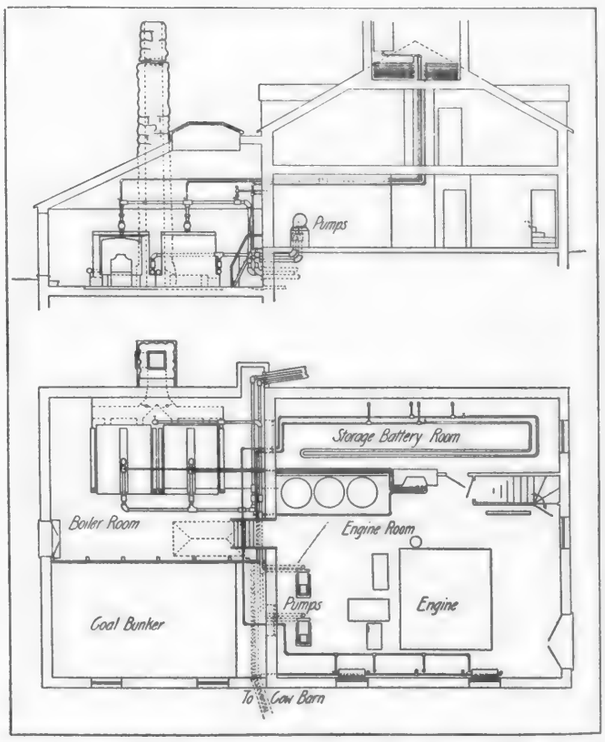
As much as possible, the conduits were disposed with a view to creating dry walks. Underdrains were provided throughout and kept above the water line of the river. The type of conduit used is indicated on the plans, the insulation being effected by sponge filling. Owing to the proximity of the conduits to the ground surface, the heat losses are naturally somewhat greater than they would be with deeper lines, but they do not constitute a danger of freezing. Of greater importance in that respect is the reliability of circulation. While pump and boiler would assure this within the mains, also it was advisable to guard against the possibility of cessation of flow in the branches in case the radiation within the several buildings, through accident or neglect, should be shut off. Accordingly, bypasses were inserted at each service entrance, with weighted checks, that will open and cause a short-circuit whenever no heat is used. The main valves, these checks and the drains are located inside and so made accessible.

All distribution piping is standard-weight, wrought iron, with gray cast-iron screwed fittings. It is carried on adjustable hangers and, where the pipe-line is carried across the bridge to the island on which the Lodge is located, rollers, supported by the bridge string-pieces, are used. Long bends in the pipes conform to the slants of the bridge approaches. Sweep bends are used on the mains larger than 2-in., and sweep tees on the boiler and pump connections.

Pipes are sized from 3½-in., at the boiler room, to 2-in. at the Lodge and other outlying buildings. Conduit is 15-in. tile for the largest pipe and 12-in. for the smallest. Drainage is provided by drain pipes, up to 6-in., laid under the conduit and graded to the river. Flow and return pipes are run on even grades, permitting air to escape to the expansion tank.

Since the water temperature is regulated centrally, to suit the weather and the requirements, the radiation within the buildings is connected directly to the service lines without intermediate controls. The pressure conditions also were favorable to this method, as all the buildings and the station are about on the same level and only one story in height. Accordingly, expansion and safety are taken care of through an open tank over the boiler room.

The buildings were equipped with direct radiation as there are no cellars, and the space underneath floors was barely sufficient for the pipe lines. Screened radiation, in some of the rooms, was desired by the owner, but plain exposed surfaces were recommended, because any form of covering would have demanded an increase beyond the already large radiation required for the lowest outside temperature of — 40° F. Particularly in the smaller rooms, the screened surfaces would have become



General Layout of Central Heating Plant, Cedar Island Lodge—the Summer White House

rather cumbersome. But quite aside from this it seemed that grillework would not be in keeping with these neat, but simple lodge buildings. Since it was possible to conceal the piping and to provide a clean and finished installation, plain radiation appeared to be the proper thing.

The buildings are of substantial wooden construction and afford good protection against the cold, but a relatively large amount of radiation is nevertheless called for, partly on account of the all-around exposure of the one-story structures. Ordinarily, only a small part of this surface is actually needed or, in other words, the water temperature, for a large part of the time should be unusually low, if overheating is to be avoided. Hence the widest range of central regulation is desirable in this case and, in order to give the best assurance in this respect and at the same time make for perfect distribution, the piping was calculated with due allowance for the heat losses in transit, so that equal mean water temperatures would result at all points of delivery. The pressure losses were carefully equalized to give the proper volumes of water without subsequent adjustments. The plant, as a whole, was designed to be simple, safe and sane, as would seem most appropriate to the purpose and for the very much out-of-the-way location.

Cheap House-Heating Possible With New British System

A NEW system of power production, which will make available electricity for house-heating purposes at extremely low cost, is being tried out in England. Limestone and coke are mixed in the ratio of 1 to 8, by weight, and burned in an apparatus similar to a limekiln, the resulting carbon dioxide being passed through a mass of glowing coke, producing a gas containing 25% to 30% of carbon monoxide. This gas can be used to heat the water or generate steam in a house-heating system, or it even may be used to run a gas engine which, in turn, is employed to generate electrical energy. It is stated that electricity can be produced for ½c. per K.W.H.

Invented by the late Doctor Reid, an analytical chemist, the apparatus is being exploited by Electric Bulk, Ltd., and Prof. A. M. Low, one of England's greatest physicists and scientists, is acting as consulting engineer, and declares the scheme is of national importance and particularly adapted to the United Kingdom. It is understood that a larger experimental plant soon will be built near London.

Wide World Photo

Airplane View of the Summer White House Grounds; the Building Almost Hidden by the Trees in the Left Foreground Is the Lodge and that in the Right Foreground Contains the Dining Room and Servants' Quarters. The Underground Piping from the Boiler House in the Extreme Upper Right Hand Corner to the Lodge Is Carried Across the Bridge in the Center Foreground

Type of Apartment Building Characteristic of the Far West in Which Gas Has Proven an Ideal Fuel

Gas Heating *for the* Heating Contractor

Part III—The Middle-West Has Large Natural Gas Areas and Many Cities Where the Use of Manufactured Gas for Heating Is Increasing Rapidly.

By G. C. Carnahan

WISCONSIN is supplied entirely with manufactured gas. Domestic heating is well under way in Milwaukee, particularly with central heating plants, most of which are water and steam. A few others have been installed, especially in the smaller cities in the southern portion of the state. Utilities in some of the smaller cities are controlled by holding companies and they, as well as that in Milwaukee, have established a special heating rate for gas, which helps to make it competitive. This activity has been under way only during the last two years and has made very encouraging progress.

Minnesota is supplied entirely with manufactured gas. Gas heating has been established in a small way in Minneapolis and St. Paul. Local gas companies have been promoting gas heating for the last couple of years and have enough installations to gather comprehensive data regarding the operating cost in comparison with other available fuel which consists chiefly of coal and some oil. Duluth is the other city in Minnesota that has done a noticeable amount of heating with gas. The gas plant in Duluth is municipally owned and the price is somewhat lower than the average as the gas is a by-product of huge local coke ovens. Gas for complete heating is not as common as might be expected, due to the absence of an active campaign by the gas company, but aggressive sales campaigns recently have been started by manufacturers of gas-fired boilers. A considerable amount of heating is done in assisting coal-fired equipment. The scheme most commonly employed is to cross-connect one or two large gas-fired circulating tank-heaters to a hot-water heating system. These are used for fall and spring heating and to assist the main plant in extremely cold weather.

One point worthy of comment in regard to heating in these cities is the general use of storm windows and insulation. The plant of one well-known insulation manufacturer is located in Minneapolis and the idea of heat proofing in building construction seems to be very well sold in Minneapolis and St. Paul. Gas heating can be said to have a foundation in this state, but the amount already sold is not very great. A favorable factor is an unusually large number of wealthy residents in Duluth and the Twin Cities.

Iowa, within the last two years, has begun to use some gas for heating, particularly in Des Moines, Davenport, Sioux City and Cedar Rapids. All gas is manufactured, but in several cities the gas companies have granted special heating rates. The competitive fuels are coal and oil. Not more than twenty-five or fifty gas-fired central heating plants are used in the entire state. These all have been installed in the last two years and are fairly well scattered, so that the information about the cost

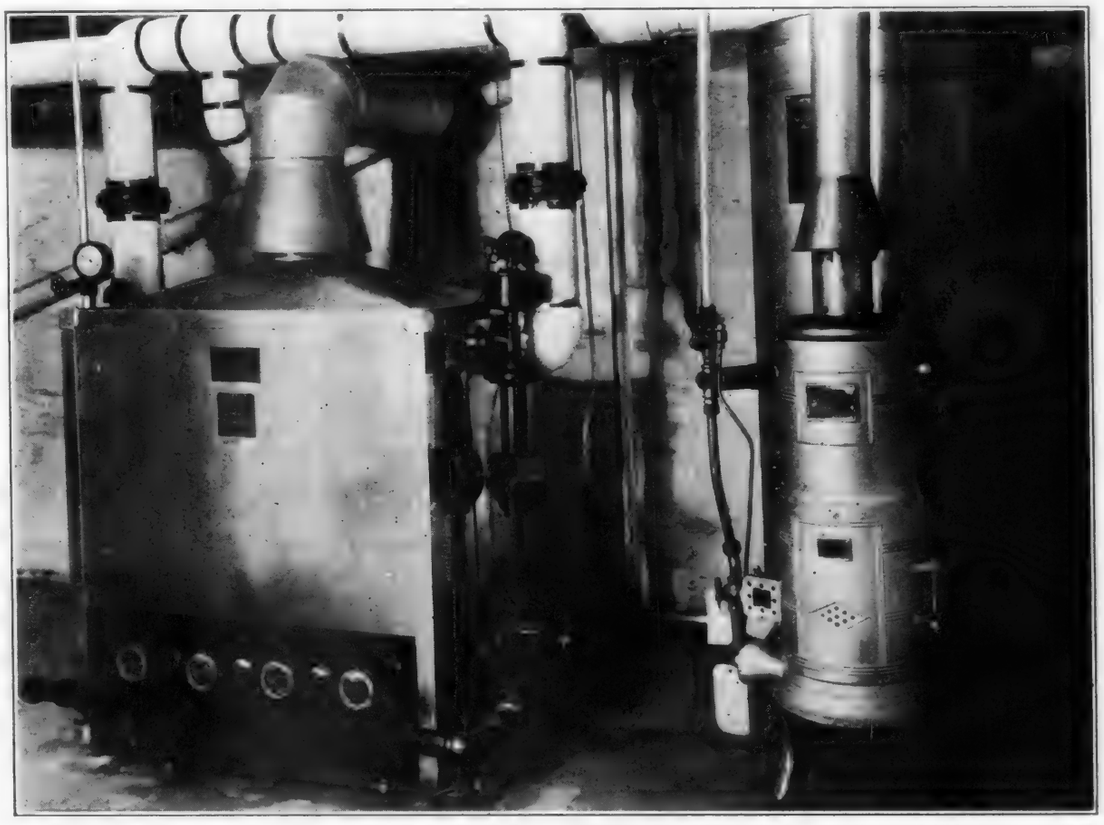
of gas heating will be more generally broadcast than in some of the other states where the sales have been confined to one or two cities.

Gas Heating Growing In and Near St. Louis

Missouri is supplied with both manufactured and natural gas. The natural gas region is along the western boundary and in the extreme southwestern section. Kansas City, Mo., is supplied with natural gas. Manufactured gas only is available in the rest of the state. By far the greatest activity in selling manufactured gas for heating is centered in St. Louis. It has been promoted here for a number of years and several hundred central heating plants have been installed. Commercial heating also has been given attention and for store and factory heating several unit heating devices have made considerable headway. Bituminous coal is the chief competitive fuel and because of its extremely low price, compared with manufactured gas, the latter has not made the progress that otherwise would seem probable in climatic conditions as favorable for gas heating as they are in St. Louis. Most of the sales now are being made in the new buildings that are being erected in the suburbs immediately adjoining St. Louis proper. Webster Grove was one of the first manufactured gas localities to actively exploit gas for house heating.

Aside from St. Louis and immediately adjoining territory, little gas is sold in the state for heating, excepting in the natural-gas region. Kansas City has several thousand installations. A large percentage of these are of the conversion type, that is, burners installed in equipment designed for coal. However, some of this burner equipment is probably of the highest order employed anywhere in natural gas regions. One type has the unique feature of combining the use of oil with gas. The oil is used only during that portion of the heating season when temperatures fall to zero. The purpose of this combined gas and oil burner is to avoid the extreme demands that are bound to exist during the coldest parts of the winter where natural gas is used for heating. It is hoped that, by augmenting the use of natural gas with oil, a gas shortage can be avoided during the few extremely cold days, thereby obviating the necessity of providing a manufactured-gas plant to be used only for a few weeks during the entire year. In the southwestern section of Missouri natural gas is used quite generally for heating. There are no large cities in this section, but centers like Joplin, Carthage and Webb City use natural gas as the leading heating fuel.

Gas heating in Illinois probably is further advanced than in any other state supplied entirely with manufactured gas. In the Chicago district there are more than three thousand central heating plants in operation, as well as several thousand gas-heated stores and other commercial buildings. Water heating plants are the most popular in this territory, with steam, or vapor, and warm air about equally divided. A large amount of commercial and store heating is done with Gasteam radiators.



House-Heating and Service Water Boilers, Both Gas Heated, Represent the Practice of Today

An Enormous Array of Offices at the Union Stock Yards, Chicago, in Which Each Office is Heated by an Individual Gas-Fired Radiator

More than two billion cubic feet of gas was used for heating purposes in Chicago and its suburbs during 1927. Gas heating is developing very rapidly in this area and will continue to do so because of the active selling program of the local gas companies, and due to the fact that an immense amount of industrial gas is used, which helps to increase the total gas sales and prevent the formation of a winter peak. At the present time the maximum daily send-out during the coldest weather in winter is only about 50% more than the average daily summer send-out and this peak apparently is not being exaggerated by the addition of the heating load. Practically all cities in Illinois either have a special rate for gas used for heating, or are preparing to make available such a rate. Considerable interest is manifested throughout the state, and installations are being made in numerous places. Bituminous coal is the main competitive fuel, with anthracite coal and oil sold in considerable quantities, especially in the Chicago district.

Indiana is well supplied with manufactured gas. Natural gas is available in a small area near the southwestern boundary and in a much larger area in the southeastern portion of the state. The larger cities—Evansville, Indianapolis and Fort Wayne—are supplied with manufactured gas. Many of the gas companies supplying the cities in the northern portion of the state are controlled by holding companies and have put a special rate into effect. Recently Indianapolis also has established a special rate for heating gas. However, only a small amount of heating business has been developed in the portion of the state supplied with manufactured gas. Development of heating in the natural-gas regions is quite marked and the sale of central heating systems designed especially for gas has been unusually good for natural-gas territory.

Cities in Michigan are supplied with manufactured gas, with the exception of one or two small areas. This state has a great potential market due to the amount of industrial business, particularly the manufacture of automobiles. However, the best progress has been made in smaller cities such as Battle Creek, and Jackson. In Detroit gas heating has been taken up only within the last year and, whereas more than two hundred installations have been made, the results do not measure up to the potential market.

Ohio, Long Depleted of Natural Gas, May Again Become Great Producer

Ohio is practically all supplied with natural gas. There are two small regions supplied with manufactured gas, one in the northeastern and the other in the northwestern corner. A large amount of heating is done in the natural-gas territory and in most places the demand for gas exceeds the supply when the winter peak is severe. This winter shortage has been solved in some cities, like Cincinnati, Akron and Lima, by augmenting the natural-gas supply with manufactured gas during the winter season. In Cleveland and Columbus heating is not making any marked progress because of threatened winter shortage of gas—which does not always materialize but which is a constant threat to those who might depend entirely on gas for heating. Many of the homes that are using gas for heating have burners installed in coal boilers in such a man-

ner that they easily can be removed and solid fuel be resorted to on short notice. Many other installations are composed of a coal and gas heating plant, interconnected.

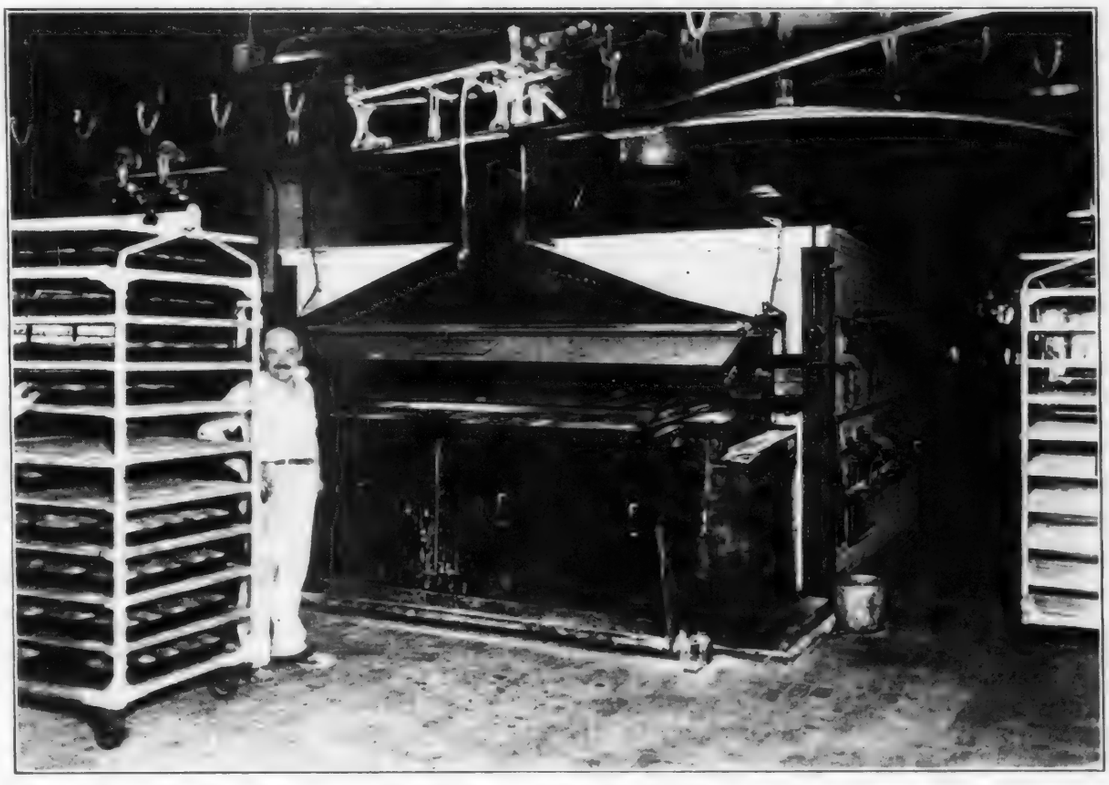
Throughout the natural-gas region of Ohio, where shortages threaten, the price of the gas is arranged to discourage heating. This is done by having the rate increase after certain quantities of gas are used. In other locations heating with natural gas has been prohibited and the ruling enforced by turning off the gas excepting during certain hours of the day. The condition in Ohio is rapidly changing. Many of the small natural-gas properties are being gathered together by large holding companies who are spending the necessary money to drill additional gas wells and extend mains to insure adequate supply at all times, and gas heating again is being encouraged. Columbus and Cleveland will have new franchises during this year and it is confidently expected that the rates will be rearranged so that the necessary capital investment can be made to insure an adequate supply of gas.

A large amount of heating is being done in some sections of Ohio in spite of these difficulties, and in Cincinnati, Toledo and Dayton, where a good supply of gas is available at all times, thousands of installations are using gas. Central heating plants are commonly used in this natural-gas region, probably more so than in any other, due to the colder climate and to the constant efforts of manufacturers of central-heating plants designed for gas, a large number of whom are located in this state. Gas stoves are commonly used and radiant heaters and direct gas-fired radiators are gaining in popularity. A state law in Ohio requires that all gas-heating appliances be vented. This has changed the character of many of the appliances, such as gas stoves, from those commonly found in other natural-gas territories.

Kentucky Fortunate in Having Large Gas Fields

Kentucky is supplied with both manufactured and natural gas. The natural gas area lies in the northeastern section and includes Louisville and Lexington, which are the two largest cities in the state. Gas users in Louisville have experienced winter shortages similar to those common in Ohio. This, however, has been remedied, as a manufactured-gas plant has been erected to take care of the increased demand and winter peak. Gas is rapidly regaining its popularity in Louisville with the establishment of dependable service. Lexington has experienced similar conditions and only within the last year or two has the winter peak been provided for. Natural gas is being extended in this state and many smaller communities soon will be supplied. The application of natural gas in Kentucky is very similar to the condition described in Ohio, except that more unit-type appliances are used. In the manufactured gas section little or no complete heating is done with gas, although a considerable amount of this fuel is used for auxiliary purposes.

(*To be continued*)



Ten of These Gas-Fired Bread-Ovens Are Installed in a Chicago Bakery and Consume 1,000,000 Cu. Ft. of Gas Per Month. These Ovens Cost Nearly $750,000

Are We Following the Wrong Idea in Heating the Air in Our Homes?

Some Thoughts *on the* Technique of Heating

By F. P. Elliott

THAT the mind of the British heating engineer is being turned toward the utilization of radiant heat becomes more and more apparent if the present-day trend is indicated by the technical press of England. The vastness and greatness of the British Empire has been brought about by men who toasted their shins before a roaring wood fire in a cavernous fireplace, or, in later days, basked before glowing coals.

It is but natural, then, that the British research worker should look condescendingly upon the "central heating" of his American cousin, who heats his home by filling it with warm air, rather than with a system designed to provide optimum comfort for the occupants themselves.

Essentially the viewpoints of the two nations may be these: The American scheme is to heat the individual by surrounding him with heated air, which has been brought to temperature by passing it over heated surfaces which may be in the room or may be "concealed"; the modern Briton, in lieu of the tremendous radiation of the fireplace enjoyed by his forebears, provides a large surface of the ceiling, wall or floor, designed to emit radiant heat that, in striking the bodies of occupants, will cause the sensation of warmth that is more intensely felt when standing in front of a blazing fire, even though the air temperature is considerably below that commonly known to us as comfortable. Studies in this realm are just beginning in the research establishments in England, and the preliminary returns, in the form of progress reports, clearly indicate that the ultimate findings are more apt to be positive than negative.

Our British Cousins Are Studying Radiant Heat Utilization

"Low-temperature radiation," just now, is receiving the serious consideration of England's foremost scientist-engineers. It might be worth while to look at this problem as it stands presented. Always, when analyzing an elementary engineering or scientific proposition, should a set-up be taken that will reduce the matter to the simplest terms.

Suppose, then, that we have two identical adjoining test rooms, without furnishings, and that we have two individuals whose physiological and psychological reactions are the same, standing in the middle of the rooms.

A Hypothetical Set-Up

We may call one room "A" (for American method) and the other "B" (for British method). In the first, let us, from an outside source, fill the room with tempered air, gradually raising the temperature until the observer is "comfortable." We must, of course, maintain a flow of air (heated "fresh" air or re-heated recirculated air) to such an extent that the loss of heat through walls, ceilings and glass, and the infiltration, is neutralized. We then must determine how much heat energy is required to bring about this state of equilibrium.

Turn, now, to the other room. Assume that we have an electric radiant heater in each wall, so fitted with reflectors that the energy output can be focused on the observer. Permit the air temperature to be 10° or 20° below that in room "A." Just so long as the radiant heat waves impinge upon the clothing and skin of the observer, they will be absorbed by these surfaces, and the impression of warmth (and comfort) will obtain. The energy output of the heaters can be so adjusted that the observer in "B" is just as comfortable as the one in "A," yet the air temperature—as well as that of the walls—will be much lower.

This may seem like a paradox, but any one who has indulged in winter hunting or sports in the far north has enjoyed the warmth of a camp fire—at least on one side—knowing that the air between himself and the fire may have been of zero temperature.

Doctor Brabbée has deduced a premise that air temperature at knee-height is the criterion for comfort and proper heating in a room. And this assumes the convection heating of the air with which the room is filled. May it not be possible that the occupants of a room can be made equally comfortable through the application of radiant heat in a manner that does not necessitate the maintenance

of high air temperature at the knee-line or elsewhere?

Again, looking at the economies of the problem, may it not be possible to attain the desired end—the comfort of the occupants of a room, not the mere raising of air temperature to a pre-determined point—with a much less expenditure of energy? And, if this hypothesis is correct, may we not thus be enabled to turn to hitherto-considered more expensive forms of heat energy, such as electricity?

The heating engineer and his co-worker in allied fields have the opportunity to solve a problem of great national economic import. Basic research, along similar lines to that recently initiated in Great Britain, coupled with a study of commercial adaptability, may pave the way to a more extended use, for domestic heating, of that most obedient and universally-applicable "fluid"—electricity.

Here, again, we find our English cousins studying the problem, from the angle of application, closely hugging the idea of converting electrical energy into radiant heat energy, to be applied as was the fireplace heat.

Will Electricity Enter the Domestic Heating Field?

In discussing possible domestic applications of electricity, A. J. Milne and R. H. Rawll, in a paper read before the Institution of Electrical Engineers, point out that with electricity at 1d. per K.W.H. an electric radiator often can compete in cost with the open coal fire, especially when the period for which heat is required does not exceed three to four hours. Also the advantages of cleanliness, labor saving and convenience of electric heating should not be overlooked. Heat requirements of different rooms vary much, but as an approximate rule 1½ to 2 watts per cubic foot of space should be allowed for sitting rooms, and half this amount for bedrooms. Attention is directed to one drawback commonly associated with the electric radiator—that one could not draw up in front of it in really cold weather and obtain the comforting effect of a coal fire. The introduction of the reflector type of fire has helped considerably in this respect. The authors present results of a test in diagram form to show the difference in distribution of heat from such a fire, as compared with the more diffused type of electric radiator. At a height of 3 ft. the reflector type shows up very favorably.

Panel Heating and Its Limitations

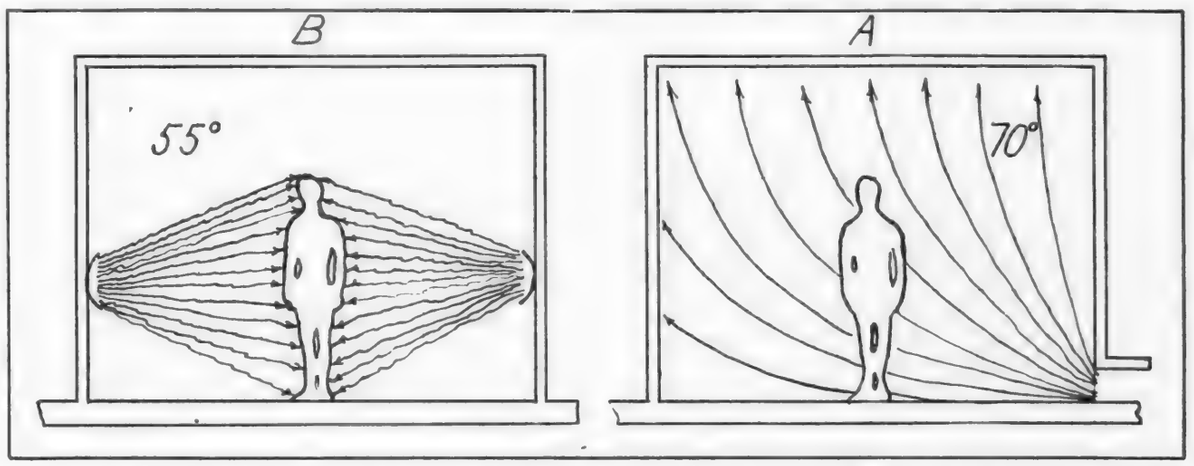
Panel heaters, either of the flush or surface type, also are in demand. For general purposes 12 sq. ft. of panel should be allowed for every 1000 cu. ft. of space, or 0.5 watts per cubic foot. Such panels cost about 12s. 6d. per square foot for reasonable length. Owing to the time lag, steam or water panel heating cannot compete with the electric radiator for short-period warming.

It is essentially a long-hour system, and may be switched off for a couple of hours over the peak load without noticeable effect on the rooms. In general, heaters will not be on for more than five hours per day during winter months.

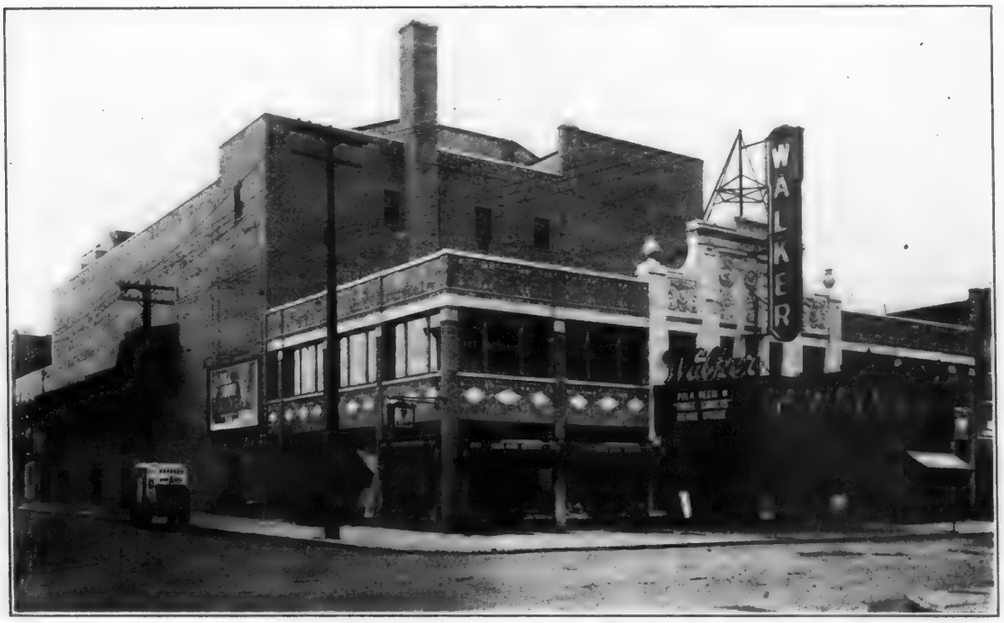
It is improbable that panel, tubular or types of water heaters will entirely take the place of the ordinary electric heater for domestic use, but a very efficient installation can be obtained by some form of heat storage, which, although now extensively used on the Continent, has not yet become popular in England. It is particularly suitable for use during night hours and at off-peak periods, when current usually can be obtained at low rates.

In conclusion, reference is made to the diminution in the cost of building houses which utilize electric heating. Calculations are made to show that there is a saving of $150 in building a "one coal-fire house" (equipped with one coal fire in the kitchen with hot water circulation attached, all other heating, cooking and lighting being done electrically), as compared with an ordinary house. On an all-electric house, electrically equipped throughout, there is a saving of nearly $400.

(Note: These allowances would be much greater in the United States).



Diagrams Illustrating (A) Providing Comfort for Room Occupant by Heating the Air in the Room and (B) by Directly Heating Occupant with Radiant Heat



Air Conditioning *in a* Movie Theatre

Description of Simplified Arrangement as Used in a New Brooklyn Playhouse

AIR conditioning for the smaller-sized theatre—one that has been built in a growing locality where the future can only be predicted—involves not only a design to fulfill the physical requirements, but operating costs as well, which should be within the financial scale justified by the revenue of the house, and so planned to add further comforts for its patrons as the growing community warrants. In the Walker Theatre, Brooklyn, these conditions have well been met.

Ventilating Equipment

For ventilation five separate fans have been installed, three serving to supply fresh air, and two for exhausts. The main supply fan takes air either from the fresh-air intake, the re-circulation flue, or both, through air heaters, and discharges this air into the galvanized-iron ducts, located in the attic space and in the balcony plenum, from which the air enters the theatre through the various plaster grilles located throughout the building.

To serve for summer cooling until refrigeration is installed, two typhoon supply fans, one on each side of the theatre, take air from out of doors and discharge it through plaster grilles to the front of the orchestra, the air finding its way out through the open doors and elsewhere.

One exhaust fan serves the toilets and smoking rooms, while the second exhausts from the projection or moving picture booth.

Air temperature is automatically regulated with provision for the future when a refrigerated cooling system is installed.

Heating Equipment

A single boiler furnishes steam to the gravity two-pipe heating system, with the supply and return piping arranged to run in pipe tunnels, serving five classes of radiation and valved independently at the boiler header consisting of:

(a) Direct radiators for theatre, stage and dressing rooms.
(b) Direct radiators for offices and stores.
(c) Indirect heaters for the ventilating system.
(d) Coils in the service-water tanks above roof.
(e) Domestic hot water tank in boiler room.

Steam risers in general are one-pipe and are concealed in the principal rooms. Runouts to the first-floor radiators are taken direct from the steam main.

The boiler is a Fitzgibbons portable-type, with a capacity of 12,500 sq. ft. of radiation, burning

anthracite coal, and is equipped with a Sylphon balanced vapor damper regulator.

Check valves are placed in the return connection from each heating coil, in each row of the air heaters, in the return from each section of the heating system, and in the return connection to the boiler.

Each radiator has, on its supply connection, a globe radiator valve with union nipple connection and a 1/8-in. automatic air-valve. Quick-vent valves are installed on the return mains and on branches where the return connects to each row of air heaters, where the return drops below the water-line, as well as on the steam main at the extreme ends.

A 3-in. equalizer pipe is run from the steam pipe down to the return pipe on the boiler side of all valves.

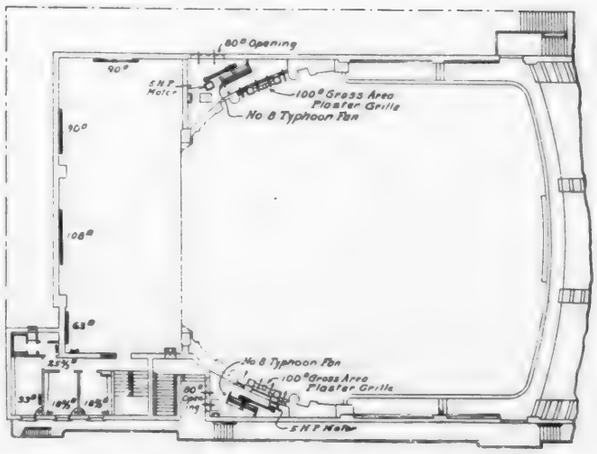


Fig. 2. Mezzanine Floor Plan of Walker Theatre, Brooklyn, N. Y.

Manual and Automatic Control of the Air Heaters

For the air heaters, each stack is provided with a control gate-valve on both supply and return, and, in addition an air valve with check is placed on the return branch. The return from each stack is the full size of the heater tapping and terminates in a top-outlet reducing elbow, the bottom opening of which is connected to the return line. The top opening has a 1-in. pipe extended up, on top of which the air valve is set, with a pet cock for hand operation, if desired. Diaphragm valves also are placed on the steam branches automatically to control the steam supply to the heaters.

Dampers of heavy construction control not only the flow of air to each branch from the ducts, but also the quantity of air to each outlet. Aisle hoods, mushroom and riser vents set in galvanized-iron sleeves and arranged to conform with the seating plan, are used as outlets for exhaust and recirculation.

On the discharge from the toilet exhaust fan, above the roof, a ventilator top is placed, while in the discharge from the moving-picture booth an automatic louvre is installed.

Automatic Control

Automatic temperature-control is provided for the air supply to the auditorium and consists of a thermostat, located in the intake chamber and controlling the fresh-air intake damper as well as the recirculation damper. A two-point thermostat is located at the front of the balcony and controls the air heaters and mixing damper under the heaters, all thermostats being of the intermediate-acting type.

Motors for operating these dampers are of the pneumatic-diaphragm-lever type and the dampers themselves are of louvre pattern. Blades of the dampers are constructed with overlapping edges, making a tight fit when closed, and are made to act in unison by means of connecting levers.

To furnish the necessary motive power for the

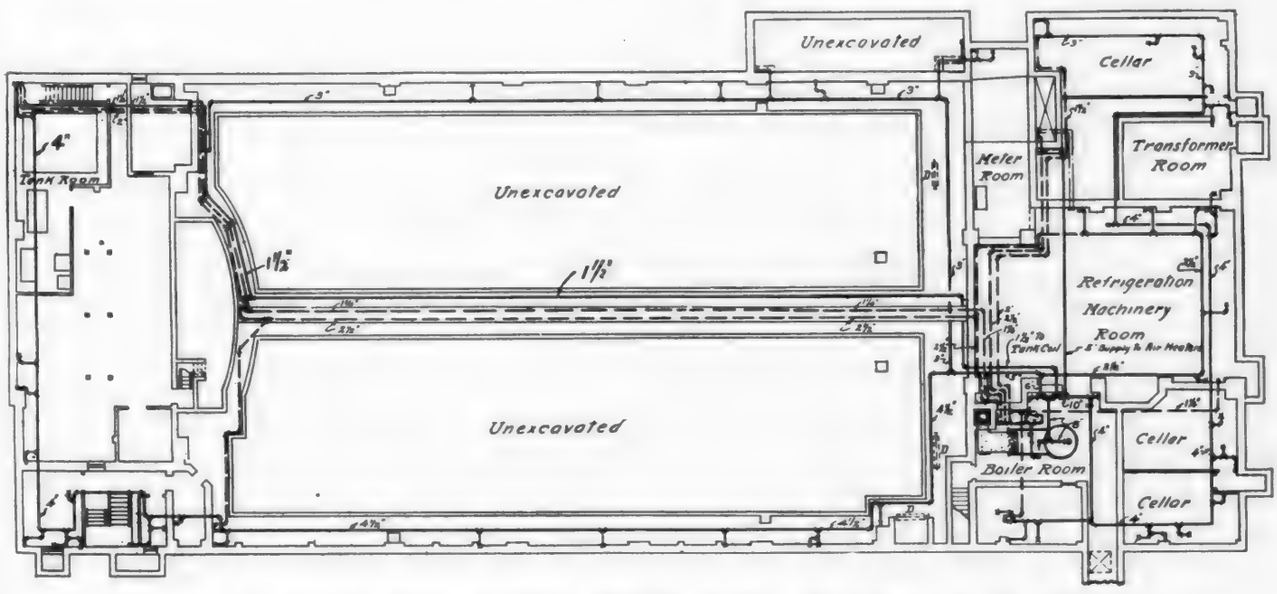


Fig. 1. Basement Showing Equipment Rooms and Heating Tunnel to Stage End of Theatre

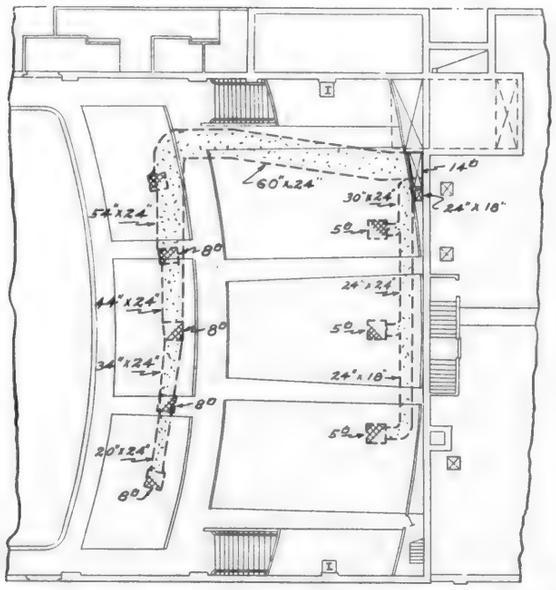


Fig. 3. Balcony Plan Showing Arrangement for Ventilation

damper motors, an electric-driven air compressor with the usual storage tank is used, the compressor being equipped with an automatic governor.

Fans and Heaters

The main ventilating fan is a Buffalo Duplex Conoidal No. 14, single-width, single-inlet fan, with top vertical discharge, having a capacity of 60,000 C.F.M. operating against a static pressure of 1¼ in. when run at 212 R.P.M. This fan is belt-connected to a 25 H.P. motor, as shown in Fig. 4. The projection-room fan, handling 2000 C.F.M., is set on the floor, also shown in Fig. 4, with top vertical discharge 14 in. x 16 in. which is carried through the roof, with a gooseneck terminal above the roof. The toilet exhaust-fan is located in the main fan room and is not shown on the drawings; it is a fan similar to the one just described, except that it is double the capacity.

Both fans and motors are set on wood copings with cork deadeners; there is a canvas connection inserted between the fan and the galvanized ducts.

All of the air heaters are Aerofin, and are operated at 4 lbs. boiler pressure. They are set in a vertical position and the air passes through them in a horizontal direction.

In each roof tank is installed a 1½-in. pipe coil connected separately and directly to the steam header. The valves for controlling these coils are located in the boiler room.

Method of Operation

While no cooling equipment has been included in the initial installation, provisions have been made and space has been provided for an air washer as well as for the necessary refrigeration machinery which would be located in the basement. Cold water lines from the basement to the fan location in the attic have been installed for the future cooling system.

From the main-supply fan the air passes through a system of ducts, the major portion going to the openings in the ceiling of the auditorium, from which it passes down to the floor and out through the floor outlets located in the main and balcony floors. The remainder of the air enters through the ceiling under the balcony. A portion of all the air may be returned for recirculation; the rest is lost through outward leakage.

The architect for this building is C. A. Sandblom, New York, and the heating and ventilating contractor, the Murland Engineering Company, also of New York.

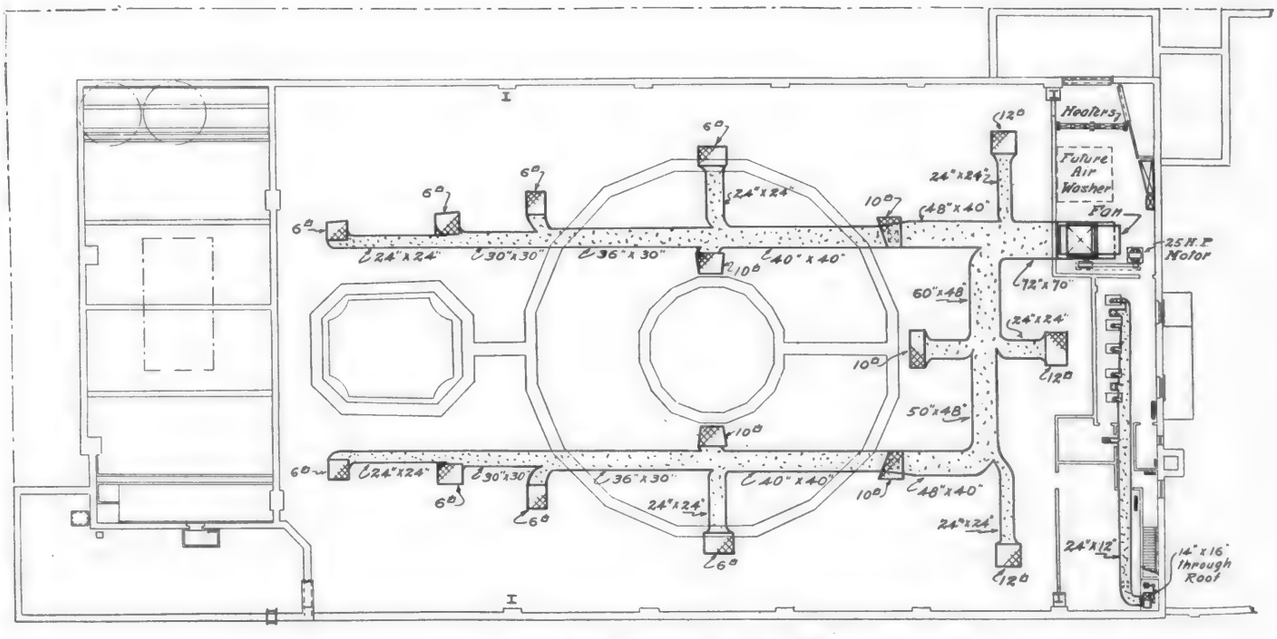


Fig. 4. Projection Room and Attic Plan

Replacing the Old Heating Plant

Part II

Installing Radiators in an Old Home Frequently Becomes a Compromise Between Locating Them Where They Theoretically Belong and Finding Less Desirable Locations to Avoid Moving Essential Pieces of Furniture. Tact and Diplomacy Are as Necessary as Mechanical Skill.

By David B. Hayes

A COLONIAL house, sketch plans of which are shown in the drawing, has no pipe showing except in the passageway between the kitchen and dining room. I might say that possibly the only difference between an installation of this kind and a new house installation is that in the former the radiators are placed where they belong and the furniture then is brought in and arranged, while in this rehabilitation work, you must arrange your radiators to fit with the furniture already in the house. Several variations from the ideal arrangement were made in this job on account of the furniture.

Problems of Locating Radiators in Home Already Furnished

The radiator locations marked No. 1 and No. 2 in the living room were those I originally selected, but the location of No. 1 would be back of a baby grand piano that the owner did not want moved. Radiator No. 2 would come behind an antique sofa. No other place in the room would satisfy the owner (or else the sofa must have been nailed to the floor) so we compromised by placing three radiators in places indicated by "Here". In the front hall, the radiator was laid out to go at the right of the door, but this location was occupied by an umbrella stand and visiting card table and so I took the only available space, under the stairs, and increased the size of the radiator so that it would provide for the second floor hall.

In the dining room, the proper location was either No. 4 or No. 5, the former being better, but I anticipated that the proposed location of the hall radiator might meet with objection when I first measured the house and talked with the owner; also location No. 4 was objectionable because of a very large table in front of the window on which was a beautiful table lamp of colonial design that had been made into an electric lamp. In talking with the owner, I sensed the fact that this lamp was lighted to give a touch of colonialism to the home and you can rest assured that I hit the nail on the head. With location No. 4 unavailable, the next best place was No. 5, to take care of the cold blast of air that would come in when the front door was opened. If the hall radiator was not to be located at the door, No. 5 was objected to because it changed the position of a glassware cabinet when the regular dining-room cabinet was at the opposite side of the archway leading from the room to the hall. By moving the serving table just a little off center of the space where it was set, it was found that the radiator could be put in the corner marked "Here." The owner remarked, "Well, I suppose I'll have to give up that space, but the room will look lopsided"; and that settled the matter.

I had anticipated no changes on the second floor but I was not to be let off so easily. I realized that corners are the most valuable spaces for the location of bedroom furniture and particularly that a corner between windows was most desirable for a dresser, or dressing table, so I planned for radiators under the windows and at the most convenient places to which pipes could be run without exposure

on the first floor. However, in chamber No. 2, I had to change to the warm corner of the room to obviate the necessity of moving a writing table and to permit the owner to enjoy the early morning sun.

Some Stringent Restrictions

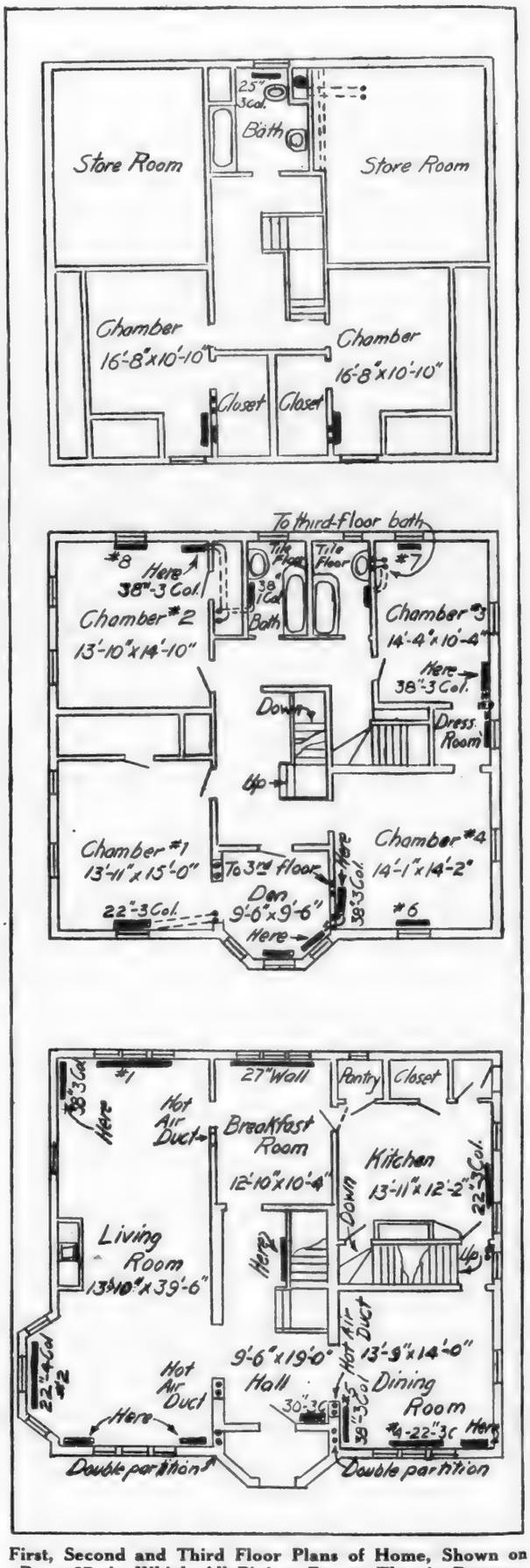
Chamber No. 3 was the daughter's room and I was told that I could put a radiator there if I could find a space not occupied by furniture; otherwise, no heating plant would be put in. By the exercise of diplomacy some of the furniture was moved and the daughter was more than delighted when I suggested that a little radiator in her dressing room would give her a cozy place in which to dress without overheating her sleeping room.

Concealed Radiation Placed Under Stairway in Colonial Home Because Owner Objected to Radiator in Proper Location Near Front Door

Chamber No. 4, the guest room, was beautifully furnished with perfect old colonial furniture without an error in detail—even the floor was of wide boards, partially covered with hand made mats. I was told that not one of these boards could be disturbed, even if I had to come through the walls from the store room (marked "Den") and spoil the looks of that room, but I won this argument; the radiator was put in the location called for and not even a scratch showed that the floor had been disturbed.

Radiation for a sewing room was designed to go under the middle window, but the owner insisted that the sewing machine must remain there so it would have light from both sides as well as from the front. The long wall was taken up by a cutting-out table and the opposite window of the bay would have been "second-best" location because of the exposure, except for the fact that "it would be in the way of the seamstress." The third floor did not

Editor's Note: The interior photographs shown in this article were not taken in the home pictured in the headpiece and shown in the plans on this page, but well illustrate the principles brought out by the author.



First, Second and Third Floor Plans of Home, Shown on Page 67, in Which All Piping, Except That in Passage Between Dining Room and Kitchen, Was Concealed

The Original Heating Plant in the Living Room of this Old Colonial Home Consisted of Two Open Fireplaces; the Other Side of the Room after Installation of the New Plant Is Shown Below

particularly interest the owner except for the specification that the room must be made at least as warm as the owner's chambers.

With the old warm-air ducts available and the space between the double partitions on the first floor, where the sliding doors had been removed, it is evident that it only required a little planning to conceal all of the pipes except the one pair that was run in the passageway, and the only floors that required removing were those in the daughter's room, No. 3, in the sewing room, and the floor in the closet of room No. 2. Securing this contract was almost entirely a matter of convincing the owner that his beautifully built and furnished colonial home would not be disturbed, marred or disfigured through the installation of radiator heat. Radiators are of the "Eastwood" type, enameled ivory to match the ivory-white woodwork. The owners of this home were so delighted when the work was completed that they became ardent boosters.

When a Modern Steam Heating Plant Was Installed the Radiation Was Handled in a Manner Entirely in Keeping with the Type of Home and Old Colonial Furniture

Tubular Electric Heating System *Used in* Great Britain

By A. C. Blackall

A NEW method of electric heating recently has been developed by Young, Osmond & Young, Ltd., London. It is known as the unity tubular electric system and provides a large heating area, working at a low surface-temperature approximating that usual in conventional water systems. Because the tubular surface enclosing the resistance wires is placed horizontally, the volume of air directly heated, during any period, is considerably greater than is the case where smaller areas at higher temperatures are employed. In addition, greater uniformity in heat distribution is obtained.

Slow warming up, a defect which hitherto has existed in low-temperature electric equipment, has been eliminated in the unity tubular system. The surface temperature of the tube commences to rise rapidly as soon as the current is switched on, due to the special element construction. There is no porcelain in the interior of the tube, and the element is laced through a mica strip which is suitably reinforced at the edges. Even in the event of a break occurring in the wire, it is impossible for the element to touch the steel tube, as the holes in the mica are spaced at ½-in. intervals, while the tube has a diameter of 2 in.

The absence of porcelain in the tubes not only has reduced considerably the weight of the heaters —an advantage both in transportation and installation—but the tube is unbreakable. Maximum strength and efficiency have been obtained with minimum weight.

A flexible mica-supported element is used—a feature which permits its adaptation to curved tubes. This enables heaters to be used in many positions in which straight runs are difficult to arrange economically. In the case of bay windows the use of three straight tubes would entail at least two and probably three wiring points, but a unity tubular bay-window heater requires only one connection and the cost therefore is materially reduced.

The heaters are supported by standard wall clips. Where two or more tubes are to be mounted one above the other, multiple floor brackets are provided instead of clips.

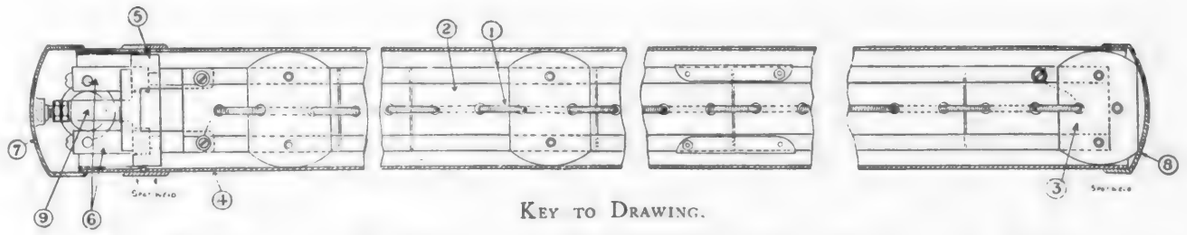
In general the heating tubes are placed round the perimeter of a room, so as to obtain as even a distribution of heat as is possible. Special care is taken to provide tubes close to the incoming draughts—near doors and below windows. If, as may happen in large lofty rooms, the perimeter is too short for the total length of tubes, a second or third row can be used. For maximum economy, it is desirable to use tubes as long as possible—up to a maximum of 17 ft., as this reduces the number of wiring points required.

It is unnecessary to switch on current more than one or two hours before heat is required. In offices and similar buildings where regular hours are observed, the heaters can be switched on automatically, say at 7 A.M., so that the air is comfortably warm by the opening hour. In order to prevent waste of current the circuits can be switched off in the evening, half an hour before work is finished.

It is interesting to note that what is believed to be the largest time switch so far built in the United Kingdom, viz., one of 1000 amp. capacity at 230

Tubular Heaters in a London Automobile Showroom

Cloak Room in a London School, Showing Heaters for Drying Students' Clothing



KEY TO DRAWING.

1. Element. 2. Mica Frame. 3. Mica Insulator (spaced every 6ins.) 4. Tube.
5. Terminal Base. 6. Terminals. 7. Terminal Cover. 8. End Cap. 9. ¾" Screwed conduit outlet.

Section Through Standard "Unity" Tubular Heater

volts d.c., was recently installed to control a large tubular heating installation.

In order to obtain current at minimum rates it frequently is necessary to restrict the hours during which it is used. For example, most central stations experience their greatest load from 3 to 5 P.M. during the winter months, when they require the full use of their plant to produce current which can be sold at the maximum price. There usually is no disadvantage in manually cutting off the supply of current for these tubular heaters during these peak hours. A suitable time switch will break the circuit at the required time and remake it when the peak load is over.

A combination of time switch and thermostatic control is an economical means of operating tubular heaters.

This tubular electric system gives one-half of its heat by low-temperature radiation, the remainder being carried away by convection currents. In comparison, it is claimed that the ordinary low-temperature radiator gives off only from 5 to 10% of its heat by radiation and the balance by convection. Modern requirements seem to call for the higher proportion of radiated heat.

British Research Board Reports on Factory Heating System

A RECENTLY issued report by the Industrial Fatigue Research Board of Great Britain incorporates investigations made by Dr. H. M. Vernon and M. D. Vernon, assisted by Miss Isabel Lorrain-Smith. This report is a continuation of an earlier investigation by Dr. H. M. Vernon and T. Bedford, assisted by C. G. Warter, and is concerned principally with the heating of factory buildings by systems of low-temperature radiation. Apparently the board is unable to draw definite conclusions on many of the points at issue, but the report presents some interesting results obtained by the use of low-temperature radiation, and outlines some of its inherent limitations.

Without any conclusive evidence in favor of the claim, it has been suggested that radiated heat is, in itself, more comfortable and healthy than convected heat. Be this as it may, it is certain that the effect of any transfer of heat must depend not only on the way in which it is transferred but on its amount and intensity. Probably the comfort of radiated heat is felt most acutely out of doors in brilliant sunshine on a winter's day, when in still air it is possible to remain perfectly warm while enjoying the stimulating effect of breathing cold air.

Studies by the board were concerned with radiation at 100°-120° F., such as is obtained by the modern panel system of radiation.

Studies Open Questions on Desirability of Radiant Heat

Results given in the report apply only to the particular conditions in which they were obtained, and other installations may give different results. They are, however, sufficient to show that no general claim can be made on behalf of radiant heat irrespective of its quantity and intensity. When the radiant heat was obtained from low-temperature sources, it was found that the air was something less than 1° F. cooler than the walls, and when it became cooler still, the room ceased to be comfortable. When, on the other hand, an exactly similar room was heated by a gas heater or coal fire, people within it remained comfortable when the air was as much as 7° F. cooler than the temperature of the walls.

It is suggested in the report that the panel system is quite likely to supersede, to a large extent, the hot water radiator and plenum air installations that have become usual in Great Britain of late years, chiefly owing to the fact that it can give a more uniform distribution of heat. In some instances, for example, it was found that the air temperature, in panel-heated rooms, did not vary more than 1°-2° F. at any position or level in the room, while water radiator installations, and, to a greater degree, plenum installations, have been found to give an air temperature near the ceiling 10°-20° F. higher than at the floor level.

A radiant-heat installation in a large room, however, requires to be supplemented by small conventional radiators, placed as low as possible below each large window, so as to counteract the draft caused by the cooling effect of the windows. The report states that little evidence was found that radiant heat from such panels had any quality different from that of convected heat, notwithstanding the fact that the walls of a room with radiant-heat systems are usually about 3° F. warmer than the air, while, with convected heat system, they are about 3° cooler than the air.

Heating and Ventilation Specifications

Part V—Verbal Instructions, Patents, Fees and Charges, Ordinances and Laws, and Insurance

By Harold L. Alt

TO prevent one bidder from getting "inside information" to the detriment of other bidders, it is advisable to have all inquiries concerning the proposal, plans, and specifications submitted in writing, and, if any of them are of such nature as to justify additional information, to convey this information by a circular letter to *all* bidders.

This is covered in GC-11, which eliminates efforts on the part of bidders to get an advantage over their competitors by obtaining special and confidential decisions before bidding.

GC-11 VERBAL INSTRUCTIONS:

Neither the Owner nor Engineer (nor Architect) will be responsible for verbal answers or instructions given by any person to inquiries as to the meaning or intent of the drawings and specifications previous to the award of contract. Should any bidder be in doubt as to the intent or meaning of the drawings and specifications he shall make inquiry in writing to the Engineer (or Architect), the reply to which, if made, will be communicated to all bidders.

Among other contingencies assumed by a Contractor in undertaking a contract is the one in connection with patent rights of the inventors or manufacturers of various equipment which the contractor may be inclined to install. This again is based on the supposition of the contractor being familiar with the practices and details of the trade, whereas the owner is entirely unfamiliar with such points and, as the contractor's price is pre-supposed to cover *all* expenses of the contract and not just a *portion* of the cost, he is called upon to pay all royalties, license fees and even to defend any litigation which may be brought over material or methods used by the contractor, either on the equipment or in carrying on the work. This is covered by GC-12.

GC-12 PATENTS:

The Contractor shall pay all royalties and license fees and shall save the Owner harmless from loss or annoyance on account of suits or claims of any kind for violation or infringement of any letters patent or patent rights by the Contractor or any one directly or indirectly employed by him or by reason of the use by him or them of any art, machine, manufacture or composition of matter on the work in violation or infringement of such letters patent or rights.

GC-13 FEES AND CHARGES:

This Contractor shall procure all necessary permits or licenses to carry out this work and pay the lawful fees therefor. He shall arrange for all tests on any or all parts of his work if required by the authorities having jurisdiction, or local service companies, paying all charges for same.

Specification No. 1 practically duplicates the above but in briefer form as follows:

PATENT RIGHTS:

The Contractor shall protect the Owner from all claims for infringement or alleged infringement of patent rights which may relate to articles in or incident to the construction of the building.

Specification No. 2 refers to the general conditions of the General Contract for this item.

Specification No. 3 covers the same ground with:

PATENTS:

Should patented articles, methods, materials, fixtures or apparatus be used in the work the contractor shall acquire the right to use the same and shall hold the Board of Education and its agents harmless against any delay, action, suit or costs growing out of the use of any patent.

Specification No. 4 refers to the General Conditions of the General Contract for this subject and Specification No. 5 does not cover protection against patent infringement but states that, under the law, "no patented article shall be contracted for except under circumstances when there can be a fair and reasonable opportunity for competition."

In Specification No. 6 the matter is handled in a similar manner, as follows:

PATENTS:

The Engineer will not recognize demands brought on account of infringement of patents, but will hold the contractor and his bondsman strictly responsible for any delay or cost resulting from his failure to protect the owner fully against patent rights.

Under his contract the contractor is expected to arrange for the payment of any necessary fees either for permits or inspection by the authorities and even by the local service companies, and is presumed to arrange for such inspections or tests without annoyance to the owner. In some cases it may be a requirement for the owner to officially sign applications for service such as for electricity

but any charges in connection with the installation of same and any charges for operation up to the time the job is officially turned over to the owner are strictly up to the contractor. See GC-13.

Specification No. 1 does not cover this item and Specification No. 2 refers to the General Conditions of the General Contract, but Specification No. 3 goes into the matter in considerable detail, as follows:

PERMITS AND LICENSES:

The contractor shall give to the proper authorities all notices as required by law relative to the work in his charge; obtain all necessary official permits, licenses for water, temporary enclosures and obstructions or excavations in public streets and pay such proper and legal fees to public officers and others as may be necessary to the due and faithful performance of the work, and which may arise incident to the fulfilling of the contract. The building permit and water license for the entire work shall be obtained and paid for by the contractor.

Specification No. 4 does not make any mention of this item nor does Specification No. 5 or No. 6.

It is also expected that the contractor will conduct himself within the law and not bring down any legal complications on the building or the owner by failure to observe the ordinances governing this class of work even though the owner may desire or the engineer may wish or specify something against which regulations exist. Hence the paragraph given in GC-14.

GC-14 ORDINANCES AND LAWS:

Nothing contained in this specification or shown on the drawings shall be so construed as to conflict with the rules of the National Board of Fire Underwriters or any local, Municipal or State regulation governing the installation of the work specified herein, and the requirements of same. All such laws, ordinances and regulations, where they apply to this work, are hereby incorporated into and made a part of these specifications. All requirements of such shall be satisfied by this Contractor at no additional expense to the Owner.

Specification No. 1 goes into this matter in considerable detail as will be noted in the next three paragraphs:

DEPARTMENTS HAVING JURISDICTION:

All of the work must be executed in accordance with the requirements of the Building, Plumbing, Health and Fire Departments and any other Municipal or State Departments having jurisdiction.

All of the provisions of the Building Code of the City of.....and any subsequent rulings shall be considered a part of these specifications and all contracts. If any subsequent ruling after the contract is signed should require additional work the Contractor must submit the matter to the Architects for adjustment as provided for in the paragraph entitled

MODIFICATION AND EXTRA WORK:

Each Contractor must, therefore, verify the validity of any work called for in the specifications or shown on the drawings and details before ordering any material or completing any of his work. Any confliction with the rulings or regulations of the Departments and Officials hereinbefore mentioned, must be reported to the Architects immediately; the Contractor will be held responsible and accountable for any errors or regulations embodied in this paragraph.

Specification No. 2 says:

COMPLIANCE WITH REQUIREMENTS OF AUTHORITIES.

All apparatus furnished and all work performed shall comply in all respects with the requirements of all public authorities having jurisdiction and with those of the Underwriters.

Specification No. 3 states that:

All work and materials shall comply in every respect with the Revised Building Ordinances of the City of....., unless otherwise specified herein, and such laws are to be considered a part of these specifications, and the contract to which they relate.

Specification No. 4 does not touch on this subject while No. 5 says:

LAWS AND ORDINANCES:

The respective Contractor shall comply with the provisions of Chapter 615 of the laws of 1922, known as the Workmen's Compensation Law, and acts amendatory thereof; also with the provisions of the Labor Law; each as respectively provided for in the Contract, copy of which may be seen in the Estimating Room.

Specification No. 6, in the matter of permits states that:

PERMITS:

The Contractor must obtain all permits and certificates of inspection, give all necessary notices, pay all fees and charges, and comply with all the State Building and Sanitary laws and all Municipal rules, ordinances and regulations relating to building and the preservation of the public health and safety.

All work shall be done in accordance with the latest rules of the National Board of Fire Underwriters. In case the Contractor shall violate any ordinance or rule, he shall be held responsible for all damage and expense arising therefrom.

There is a provision incorporated in some specifications making it an obligation on the part of the contractor to pay attention to other contractors doing work in the building which may conflict with

the contractor's work when he comes to install his own equipment later. The paragraph quoted in GC-15 is plain enough in this respect and speaks for itself.

GC-15 CONTIGUOUS WORK:

If any part of the Contractor's work is dependent for its proper execution or for its subsequent efficacy or appearance on the character or condition of his own or associated or contiguous work not executed by him, the Contractor shall examine and measure such associated or contiguous work and shall report to the Engineer (or Architect) in writing any imperfection therein or any conditions that render it unsuitable for the reception of his work. In case the Contractor proceeds without making such written report, he shall be held to have accepted such other work and the existing conditions and shall be responsible for any defects in his own work consequent thereon, and he shall not be relieved of the obligation of any guarantee because of any such imperfection or condition.

None of the specifications under consideration contains any paragraph covering this point. It is, however, a very good item to insert, as it does away to some extent with divided responsibility.

In the matter of fire insurance it is usually customary either for the owner to carry the entire insurance payable to the various contractors on the job as their interests may exist at the time of the fire (should any develop) or else each Contractor carries the entire insurance of his work up to the time it is formally taken over by the owner.

Where the Contractor is desired to carry insurance a paragraph similar to GC-16 may be used.

GC-16 FIRE INSURANCE:

This Contractor shall provide and maintain, during the entire progress of this work, and until it is accepted, sufficient fire insurance to indemnify the Owner against any loss by fire affecting work or materials furnished by this Contractor. The Contractor will be held responsible to the extent of the amount paid by the Owner on account of this work.

Note—(To be used only when Contractor is required to carry fire insurance.)

But if the Owner intends to carry the insurance a paragraph similar to GC-17 may be inserted.

GC-17 FIRE INSURANCE:

The Owners will insure this work, the policies to be made payable to the parties hereto as their several interests may appear.

Note—(To be used when Owner carries the fire insurance.)

In Specification No. 1 is found the following:

The Owner will, from time to time, secure policies of the fire insurance covering all material furnished and work done under each separate contract.

Specification No. 2 does not mention this item, while Specification No. 3 says:

The building and all materials, fixtures and apparatus in the building or on the premises shall be insured by the contractor up to the time it is completed and accepted. It is hereby understood and mutually agreed that the building and all materials, fixtures or apparatus in the building or on the premises are in the custody and under full responsibility of the contractor up to the time the building is accepted as completed.

GC-18 ACCIDENT AND LIABILITY INSURANCE:

The Contractor shall maintain such accident and liability insurance as adequately will protect him and the Owner from claims for damages or personal injuries arising directly or indirectly from operations under this contract, complying with all laws covering this subject, and he shall be liable to the Owner for failure to maintain such insurance. The Contractor shall, if required, submit the policies to the Engineer (or Architect) for approval.

Specification No. 4 does not cover this item; Specification No. 5 refers to the "contract form" for this information while Specification No. 6 reads:

The Contractor must obtain, at his expense, all necessary policies of insurance on work and materials supplied by him, as the same will be at his risk until final completion, inspection, and acceptance, but the contractor will be relieved of any risk for that portion of the building occupied by the Owner before entire completion of his contract.

With fire insurance should be included accident or liability insurance. In general this seems to be more carefully taken care of in the various specifications than the matter of fire insurance. A good form of requirement for this item is given in GC-18.

Specification No. 1 says:

INSURANCE POLICIES:

Each Contractor shall furnish the Owner with a certificate of a Liability Policy, showing that all the employees of all his Sub-contractors and the employees on his own payroll are insured against accidents. The said certificate shall be delivered to the Owner after the contract has been signed if he so requires.

Specification No. 2, there being no general conditions, this item is not covered.

In Specification No. 3, it is required that the Contractor protect the owner as follows:

ACCIDENTS:

The contractor shall hold the Board of Education harmless from any damage or accident to workmen or to persons engaged in or about the building, or passing the same, resulting from either contract or extra work under his charge.

In Specification No. 4, this subject is treated as:

LIABILITY INSURANCE:

The Contractor shall carry approved insurance protecting himself as well as the owner against damage caused by accident in or to the building, and against liability for injury to persons during construction and until the final acceptance of the work.

In Specifications No. 5 and 6, this item is not covered.

In going back to Specification No. 1 another clause is found which, perhaps, explains more to the reader than the bare paragraph previously quoted. The second paragraph reads as follows:

INDEMNITY AND DAMAGE CLAUSES:

Each Contractor shall, during the performance of the work, take all necessary precautions and place proper guards for the prevention of accidents, and shall indemnify and save harmless the Owner and his agents from all damage and costs to which they may be put by reason of injury to the person or property of another resulting from negligence or carelessness in the performance of the work, or in guarding the same, or from any improper materials, implements or appliances used in its construction, or by or on account of any act or omission of the Contractor or his agents. The whole, or so much of the moneys due under any, by virtue of the contract (as may be considered necessary by the Owner at his option), shall be retained by himself until all suits or claims for damages as aforesaid shall have been settled and evidence to that effect furnished to the satisfaction of the owner.

Usually the next item under general conditions covers the matter of the contractor protecting his work during the period of construction; the contractor must take care of his materials and his installation against all contingencies up to the time the whole contract is turned over to the owner in a complete and finished condition. Paragraph GC-19 covers this subject.

GC-19 PROTECTION OF WORK:

The Contractor shall cover and protect his materials and work from damage by the elements or from any other cause in a manner satisfactory to the Engineer (or Architect) and shall maintain efficiently such covering and protection.

The Contractor shall, at his own expense, make good any damage to his work from the action of the elements or from any other cause.

Specifications Nos. 1, 2, 4 and 5 do not cover this particular item.

Specification No. 3 contains the paragraph:

PROTECTION OF WORK AND MATERIALS:

The contractor shall at all times cover and protect his work and the materials, fixtures and apparatus to be used therein from damage by weather or otherwise, and shall exercise due diligence to secure the same from injury, and all damage resulting from such neglect shall be made good by the contractor.

Specification No. 6 contains the following:

DAMAGE:

The Contractor will be held responsible for, and be required to make good at his own expense, any damage caused by his workmen to materials in place or on the premises or included in this contract.

Another point which should be brought to the Contractor's attention is that of not storing his material at places on the premises where it is objectionable or interferes with the carrying on of the work by other contractors. This is covered in GC-20.

GC-20 STORAGE:

The Contractor shall confine the storage of materials and the operations of his workmen to the limits indicated by law, ordinances, permits, or by the Architect and shall not unnecessarily encumber the premises with his materials.

(*To be continued*)

Heating Contractor Plays Important Part in Developing Gas Heating Business

IT is very important that a gas company should make the heating trade of its community realize that the company is not seeking to monopolize the sale of gas-heating appliances, but that it wishes to do all in its power to promote their sale through all legitimate mediums, and to secure the sale of efficient appliances and their proper installation. The electrical industry has been enormously successful in the sale of its household appliances, but this has not been accomplished by monopoly of this sale by electric utilities. It has rested upon the broad merchandising both by utilities and dealers. Gas heating merchandising will develop by the same sound methods.

It is hardly necessary to say that we must cultivate the heating contractor and the architect. They can be a great help or a great hindrance. We must show the architect how we improve the house and open wonderful possibilities for use of basement space. The heating contractor often is the key man in the situation. His advice frequently decides the owner—we want him to be a gas booster. I think that the shortest road to his head and heart is to make him see that gas heating makes two jobs grow where only one grew before. A man with a coal boiler is not a prospect for a contractor until the gas company, by making gas available at reasonable rates, and by making known its merits, creates the desire for a gas boiler. This means work and profit for the heating contractor.

If only we can make the heating contractor see what gas heating really does for him, he will become our best salesman and our most valuable asset. —*From an address by Thomson King, before the Fifth Annual New York Regional Sales Conference.*

The Heating & Ventilating Magazine

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

MEMBER

National Publishers' Association
Associated Business Papers, Inc.
Audit Bureau of Circulations
Plumbing and Heating Industries Bureau
American Oil Burner Association

VOL. 25 August, 1928 No. 8

Published Monthly at New York, N. Y., by the
HEATING AND VENTILATING MAGAZINE COMPANY

Executive and Editorial Offices, 386 Fourth Ave., New York.

A. S. ARMAGNAC . . . . . President
GUSTAVE PETERSEN . . . . . Treasurer

A. S. ARMAGNAC, Editor. G. PETERSEN, Manager.
P. E. FANSLER, Associate Editor. GEORGE A. BROWN, Eastern Representative.

Western Office: CLIFF W. PRESDEE, Manager
750 Builders Bldg., 228 North La Salle St., Chicago, Ill.

European Representative: W. G. HOLLINWORTH
Somerleyton Road, Oulton, Lowestoft, England.

Subscription	$2.00 per year
Canada	2.50 per year
Foreign Countries	3.00 per year
Back Numbers	50 cents each

IN analyzing the Philadelphia market with respect to its possibilities for the sale of heating and plumbing material, the Plumbing and Heating Development League of Philadelphia, working in co-operation with the Plumbing and Heating Industries Bureau, has produced a novel and interesting picture of the sales possibilities in this typical American city. When the league undertook the analysis, it endeavored to procure answers to the following questions:

How many consumers are there?
Where are they located?
In what degree are they able to purchase?
How can I reach them with my sales message?
What sales message will be resultful?

One of the best things accomplished by the analysis is the division of the city into "economic zones." In this way an effort has been made to have each zone comprise people of similar incomes and, hence, similar consuming capacity. Thus, for the first time, so far as we know, the various gradations between the extremes of "good neighborhoods" and "slums" have been determined. The method used for obtaining the necessary information is equally interesting. Visits were made to each tenth home to ascertain the economic status of the family. This information, plus regard for the tendency of people to live and associate with people of similar incomes, was used to fix the boundaries of the economic zones. While, of course, nobody could assert that all of the people, in any given zone, have the same incomes, it was felt that the fluctuation is so slight that it would be safe to consider the figures truly representative. In certain cases, however, where a zone showed a wide fluctuation in income, it was broken down and split into two zones.

Among the noteworthy facts brought out in the investigation were that Philadelphia boasts of 429,532 dwellings, of which rented homes constitute 58.9%, and owned homes, 41.1%. In addition, the city has 109 hotel buildings, 3,137 apartments and 39,233 combined stores and dwellings. The total number of registered master plumbers and heating contractors was 1,532, of which, however, as was reported last month, 40% was found to have no economic justification for existence.

SUCH a notable shrinkage in the number of domestic oil-burner fires as is reported by the National Board of Fire Underwriters is a welcome indication that the element of risk in connection with oil-burner installation has been almost eliminated. Data secured in eighteen representative cities show, in nearly every instance, a notable decrease from last year. In Chicago, for instance, the reduction was more than 50%, while in Philadelphia there was a decrease of over 66%, and in Kansas City and St. Louis approximately 75%.

It is enlightening to note that "of the total number of fires or occurrences tabulated, 40% occasioned no loss." Also that "of the total number of fires or occurrences resulting in designated losses, over 75% involved losses of less than $500 and more than half of these covered losses of $100 or less."

First, among the causes of oil-burner fires, was the failure of the automatic shut-off valve. Other important causes were loose connections and leaky piping, back-fires, carbonization, and absence or extinguishment of pilot light. Minor causes, of which there were relatively few, were careless operation, absence of automatic shut-off valve, imperfect combustion, dirty flues, electric short-circuits and overheated furnaces and flues. It is evident that failure to comply with the National Board of Fire Underwriters' installation requirements has resulted in numerous fires and other troubles involving damage. Many of these occurrences undoubtedly could have been prevented through proper supervision, with efficient inspections at the time the burners were installed.

A careful study of these data makes it clear that the material betterment, both in design and construction of domestic oil burners, largely is responsible for the materially-decreased fire risks in homes heated with oil.

An Analysis of

Domestic Oil-Burner Fires

Study Made by National Board of Fire Underwriters Clearly Indicates Rapid Decline of Already Small Risks, and Credits Conditions to Improved Burner Design and Construction

THE pronounced trend toward the oil burner as a means of heating for residences has caused considerable concern as to the extent of hazard created. As a means of securing reliable data for the compiling of a fire record, in order that the hazard might be measured and analyzed, the National Board of Fire Underwriters, in 1925, prepared a special form for the reporting of oil-burner fires. These were sent to each insurance fire patrol and salvage corps with the request that they be used for reporting such fires to the National Board. The following informative data are based on these reports.

In some cases reports were made only in the case of actual fires, and in others reports were made out only to cover fires from certain causes. For these reasons it has been necessary to secure supplemental data giving the total number of fires or occurrences originating in the oil-burner system. Table No. 1 is based on the total number of reports received during the period from November, 1925, to May 8, 1928. Table No. 2 is based on

Table No. 1—Tabulation of Analysis of Oil-Burner Fires Made by National Board of Fire Underwriters. No Conclusions Should Be Drawn from this Table without First Reading the Accompanying Article

Cause	Number due to each cause	Character of Installation			Type of Burner				Method of Burner Feed			
		In accord with N.B. regulations	Not in accord with N.B. regulations	Not indicated	Approved	Not approved	Home made	Not stated	Pump	Gravity	Air pressure	Not stated
Failure of automatic shut-off valve	69	21	27	21	36	30	1	2	23	36	3	8
Carbonization	31	13	10	8	13	14	-	-	11	14	1	1
Defective burner	35	15	9	11	9	17	-	9	12	19	-	4
Loose connections - leaky piping	51	22	18	11	23	27	1	-	32	17	-	2
Poor combustion	13	5	1	7	11	2	-	-	6	6	1	-
Back-fire	41	26	10	5	23	15	1	2	23	14	1	3
Absence or extinguishment of pilot	21	3	9	9	16	5	-	-	10	9	1	1
Unknown	13	3	7	3	9	4	-	-	9	2	2	-
Overheated furnace or breeching	8	5	2	1	2	4	2	-	4	4	-	-
Improper installation	4	-	3	1	1	3	-	-	1	2	-	1
Dirty flue	14	5	8	1	6	8	-	-	6	7	-	1
Clogged feed pipe	4	2	2	-	2	2	-	-	4	-	-	-
Careless operation	14	4	9	1	5	9	-	-	6	7	-	1
Insufficient draft	3	-	-	3	1	2	-	-	3	-	-	-
Rubber hose to pilot light	2	-	2	-	2	-	-	-	1	1	-	-
Gasolene ignited by pilot	1	-	1	-	1	-	-	-	-	1	-	-
Electric short circuit	9	1	3	5	8	1	-	-	6	3	-	-
Tank overflow during filling	2	-	2	-	1	1	-	-	1	1	-	-
Water in oil	1	-	1	-	-	1	-	-	-	1	-	-
Improper fuel	3	1	1	1	1	2	-	-	3	-	-	-
Oil in air line	1	-	1	-	-	1	-	-	1	-	-	-
Cracked combustion chamber	4	4	-	-	1	3	-	-	1	3	-	-
Defective pump	3	2	1	-	-	-	-	3	3	-	-	-
Absence of automatic shut-off valve	15	14	1	-	6	6	-	3	2	8	-	-

Table No. 1 and indicates the percentage of fires or occurrences due to each cause. Table No. 3 is simply a tabulation of the total number of oil-burner fires or occurrences in cities where insurance patrols are maintained.

Of the total number of oil burner systems involved (Table No. 1), 40% apparently were not installed in accordance with the National Board regulations. Of this total number, 48% were oil burners of makes listed by the Underwriters' Laboratories, 45% were of makes not listed, and 2% were home-made or makeshift arrangements. In 5% of the cases the name of the burner was not given. The oil-burner systems involved were about evenly divided between those of the pump and gravity-feed types.

Table No. 2
Per cent of Fires Due to Each Cause

Cause	Per cent
Failure of automatic shut-off valve	20
Loose connections and leaky piping	15
Defective oil burner	11
Back-fires	12
Carbonization	7
Absence of, or extinguishment of, pilot light	6
Miscellaneous	6
Careless operation	4
Absence of automatic shut-off valve	4
Imperfect combustion	4
Unknown	3
Dirty flues	3
Electric short circuit	3
Overheated furnaces and flues	2

These figures indicate that failure to comply with the National Board installation regulations was the cause of numerous fires. That so many listed burners were involved is probably due to the fact that, in the eastern and in many of the middle-western states, most of the oil burners installed are of listed make. In other words, the majority of reports received were from territories where listed burners predominate. As to type of feed, the figures do not indicate any material difference in degree of inherent hazard between the predominating types, namely pump and gravity feed.

In many cases reports were incomplete as to cause, and it was necessary to interpret them in the light of information supplied. In other reports causes were probably incorrectly reported owing to investigator's limited knowledge of oil burners and their operation. *These features should be borne in mind when studying Tables Nos.* 1 *and* 2.

ANALYSIS OF TABLE NO. 2

Failure of automatic shut-off valves to function, and thus shut off the supply of oil, ranks first as causing the greatest number of fires. Many of the earlier valves used for this purpose were of improper design and not positive in operation, hence it is probable that many of these failures thus may be accounted for. It also is highly probable that some of these occurrences were incorrectly reported and that some were due to tampering. Considerable progress has been made in bettering the design of these devices and providing more positive operation so that the frequency of this class of failures may be expected to decrease.

"Loose connections and leaky piping" ranks second as a fire cause. This was expected as it has proven to be the principal cause of fires in connection with industrial installations. It may be accounted for by poor workmanship when the piping was originally installed, vibration over a considerable period or failure properly to protect piping from mechanical injury. High-class original installation supplemented by periodic inspections by a competent man would go far toward the elimination of this cause.

"Back-fires" stand third as a cause, but might well be combined with "imperfect combustion" and "careless operation" and arranged under the latter cause, as most back-fires are caused by carelessness or ignorance on the part of the operator. On the other hand, many back-fires are the direct result of the failure of the automatic shut-off to function. Where the flame has been extinguished by a clogged or carbonized burner orifice, which finally is cleared by the built-up pressure behind it, and if the shut-off valve has failed to stop the oil supply, atomized oil is forced into the highly heated combustion chamber where it accumulates until a sufficient mixture of air is obtained. Ignition is thus delayed and when it does take place it is accompanied by violence sufficient to blow off the furnace door and sometimes to injure the furnace.

This table also indicates "defective burner" as an outstanding cause. Fire reports giving this as a cause in most cases fail to state in what respect the burner was defective. In some cases it is reported that "the burner was cracked." It probably is true that if full information on these fires was available the fire or occurrence might prove to have been due to some other cause.

Table No. 3
Number of Fires

City	1925	1926	1927	1928
New York	13	24	32	25
Chicago	103	64	80	38
Philadelphia	32	58	91	29
St. Louis	16	17	12	4
Boston	—	53	43	19
Newark	0	20	31	12
Kansas City, Mo.	181	154	126	46
San Francisco		101	120	
Louisville	2	2	2	5
Cincinnati	4	2	3	
Indianapolis	3	9	7	3
Worcester	1	3	5	
Milwaukee	7	18	27	13
Minneapolis	43	46	58	28
Albany	4	5	5	6
Memphis	1	9	9	6
Duluth	6	2	2	2
St. Paul	8	4	5	2

GREAT IMPROVEMENT IN BURNER DESIGN INDICATED

Of decided interest is the classification "carbonization." Previous to the use of oil burners in the eastern and middle-western states, the main trouble with burners in other parts of the country was caused by carbonization. That only 7% of the fires or occurrences tabulated was due to this cause indicates to what extent this trouble has been overcome by improved design and construction.

Fires due to dirty flues and electric short-circuits might well be combined and designated "poor maintenance."

Included under "miscellaneous" are two fires resulting from the overfilling of storage tanks. In this connection it is interesting to note that, aside from these two occurrences, none of the fires reported was caused, directly or indirectly, by gravity tanks or storage tanks. The reports also failed to indicate any cases where the gravity or storage tanks were involved by fire due to other causes.

LOSSES USUALLY INCONSEQUENTIAL

Of the total number of fires or occurrences tabulated 40% occasioned no loss. In 24% of the cases reported the loss was not stated. Of the total number, 14% caused "small fire and smoke losses," 13% "small smoke losses" and 9% "small fire losses." Of the total number of fires or occurrences resulting in designated losses (36% of the total number of fires or occurrences tabulated) 42% involved losses of $100 or less, 34% more than $100 but not in excess of $500, 9% more than $500 but not in excess of $1000 and 15% more than $1000. The largest were one of $15,000, one of $12,000 and one of $6,000.

Each year the total number of oil-burner installations in any city increases. This should be borne in mind when studying Table No. 3. In the case of San Francisco, oil burners probably are used more extensively than in any other city, hence it is only natural that the number of oil-burner fires or occurrences were more numerous than in cities of similar size, or where fewer burners are installed. To some extent this also is true of Kansas City, Mo. In the smaller cities the lower fire frequency reflects the smaller proportion of oil-burner installations because of the availability of cheaper solid fuels. Con-

sidering all the factors, it would appear that the frequency of oil-burner fires or other oil-burner occurrences resulting in fire department or insurance-patrol response is decreasing in most cities. Viewed from all angles it cannot be considered as increasing in any of the cities included in the foregoing tabulation.

EFFECT OF MUNICIPAL REGULATION

Many cities have adopted ordinances regulating oil-burner installations, but, aside from requiring permits and the submission of plans, very few actually exercise supervision through inspections. San Francisco exercises the most rigid supervision of any city, maintaining a thorough inspection service. In Boston, the State Fire Marshal's regulations are in force, permits are required, but no inspections are made. Permits for tanks only are required in Chicago but the installation of the balance of the oil-burning system is not regulated. New York and St. Louis require permits and inspect installations. In Kansas City, Mo., there is no municipal supervision.

Other cities included in Table No. 3 have adopted oil-burner regulations, but few make inspections and, in general, the decreased annual number of fires probably is mainly due to improved design and construction of oil burners.

CONCLUSIONS

Failure of automatic shut-off devices to operate, loose connections, and backfires are indicated as the principal causes of oil-burner fires. It also is evident that failure to comply with the National Board of Fire Underwriters' installation requirements has resulted in numerous fires and other troubles involving damage. Many of these occurrences could have been prevented through proper supervision with efficient inspections at the time the burners were installed.

Of the total number of fires or occurrences reported and tabulated, the large majority involved no loss, or were of small extent.

INSPECTION RECOMMENDED

Considering the steadily increasing number of oil-burner installations, the number of oil-burner fires per annum tends to indicate that the frequency of such fires is decreasing. This probably is due to improved burner design and construction. Underwriters' Laboratories have contributed materially to this improvement, as many of the leading manufacturers of oil burners and oil-burner accessories have submitted their products to the Laboratories for examination and listing. On the other hand the records indicate improper installation and poor maintenance as the cause of many fires, thus illustrating the need of efficient supervision at time of installation with subsequent periodic inspections. Effective supervision, however, only can be secured by intelligent and thorough inspections, necessitating complete knowledge of oil-burner design, construction and operation on the part of the persons making the inspections.

Life of Wrought-Iron Pipe Should Be a Century

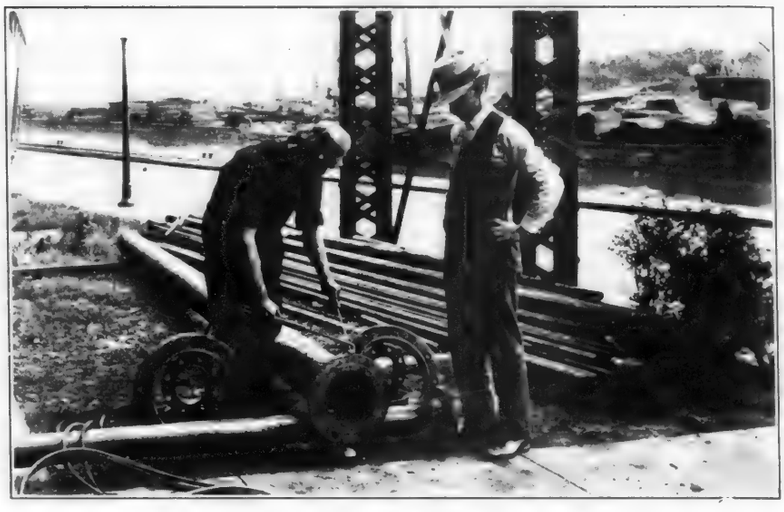
An interesting story is found in the house organ of the A. M. Byers Co., Pittsburgh, Pa., concerning the piping torn out of a New England building, after a service of 45 years, but found in such excellent condition as to be too good to discard.

The building in question is the Central Block, in Lowell, Mass., which has undergone changes in floor plan which made it necessary to relocate the steam pipe risers. Shifting of partitions left the steam pipe risers to higher stories running up very awkwardly through open spaces of the first floor, and, of course, they had to be moved. When the contractors, Welch Bros. Co., of Lowell, started to make the change, they made the interesting discovery that every one of the old types was sound. It so happened that the original installation was made by J. F. Welch, of Welch Brothers, and in commenting upon the work, he writes: "We changed the location of thirty sets of steam risers. The old pipe was installed in the building in 1881, and we used every part of the old pipe over again on the changes."

The pipe in the central building was wrought iron and the article goes on to state that if it was not made by the A. M. Byers Company, it was made by some other manufacturer who used good stuff. It is worthy of note, however, that a sample piece was found to be practically identical with current specimens of Byers pipe.

2700 Oil-O-Matic Dealers Called to Order at the Fourth International Convention—Probably the Largest Convention Ever Held in the Interests of Any Phase of Heating. For Three Days, June 25-27, with Characteristic Oil-O-Matic Ardor, the Delegates Participated in a Carefully-Prepared Program of Sales Development and Pleasure

Welding as Applied to Steam and Water Piping*



Welding Forged Steel Flanges to Pipe

Elementary Considerations of Cost, Technique and Standardization

By John H. Zink

Vice-President and General Manager,
The Heat and Power Corp., Baltimore.

PIPE welding as an art, in the heating and piping industry, is admitted to be comparatively new, and I am compelled to make the further admission that, up until the present time, those of us who have recognized and accepted welding as a new and better way of installing piping, have created our own individual standards of practice. In many instances these vary decidedly and apparently there is no generally accepted uniform practice or standardization code.

This lack of co-ordination within our own ranks, plus misrepresentation—unintentional perhaps, but misrepresentation nevertheless—as to costs, experience, equipment, liability, etc., both on the part of our own welding contractors and the equipment manufacturers as well, has caused hesitancy on the part of many of our piping contractors in accepting welding. As a natural consequence it follows that architects and consulting engineers refuse to accept an apparent uncertainty, and we can't much blame them.

I am a strong advocate of welding, and I would like to see welding stabilized so that architects and consulting engineers will incorporate provision for it as a part of their original specifications rather than to ask us to figure on a flanged or screw-fitting installation, making it necessary for the successful bidder to sell them welding afterwards.

This reticence on the part of the architect and engineer has given my organization considerable concern, especially as more than 50% of our high and low-pressure installations, during the past two years, has been welded, and less than 5% of our total welded installations was specified as an original part of the specifications. I have talked with a number of architects and consulting engineers on this question, and their hesitancy to accept and specify welding may be attributed, in part at least, to the following pertinent reasons:

1—Seldom do two or more piping contractors agree as to the scope of work to be included.

2—Considerable difference of opinion as to the merits of the "butt" weld and "V"-type weld.

3—Necessity of using forged-steel flanges instead of cast-iron.

4—Inability to state with confidence whether the specification for low-pressure installations is applicable to high-pressure installations.

5—Is welding cheaper?

6—Should the welding be done by the oxy-acetylene or electric process?

Cutting and Beveling Pipe in One Operation, the Motor-Driven Die Head Being Equipped with Two Cutting and Two Beveling Dies

*Based on a paper read before the Heating and Piping Contractors National Association, Philadelphia, Pa., June 5, 1928.

I feel that we have developed a definite and truthful answer to these questions. And yet I find, in talking with other contractors, that many of us are at variance as to uniform practice. Then, how can we expect the architect and engineer to view the situation differently than so aptly expressed to me recently:

"If you contractors can't agree on what constitutes a welding installation, how do you expect us consulting engineers to specify it intelligently?"

Let me illustrate:

I recall a typical high-pressure boiler-header installation from which high and low-pressure branch mains were to be run. The consulting engineer's specification stated that "welding will be permitted according to 'Standard Practice,'" with the safeguard that "each bidder must specify in detail in his proposal the piping he intends to weld." My company was one of six bidders with this result:

Opposite End of Test Plug Shown Above

Only two of the bidders figured on welding all piping and all flanges to the piping.

Four bidders proposed to weld the pipe and branch-outlet connections, but specified screwed cast-iron flanges on valves and where additional flanges were specified for disconnecting purposes.

Five of the bidders insisted on the "butt weld" and one alone stood for the "V"-type weld.

It so happened that the consulting engineer in this instance had before him certified tests of six butt welds on pipe, none of them equal to 60% of the strength of the pipe, and an equal number of "V"-type pipe welds, all of them stronger than the pipe itself. He promptly overruled two objections to the "V"-type weld as applied to cut or short lengths. The contractors figuring on making "butt welds" stated that their pipe was beveled at the mill and frankly admitted they were not equipped to bevel short lengths in the field. This work is easily done by the use of a power drive and die-head equipped with special dies which cut and bevel the pipe in one operation.

We use forged-steel flanges on both low and high-pressure piping to permit welding flanged connections. It may be claimed that this method is more expensive and I will agree with you. The consulting engineer does not desire you to weld most of the piping and then make up flanged connections with screwed flanges, for the reason that thereby you defeat the very purpose for which welding is done, i.e., the elimination of threaded connection.

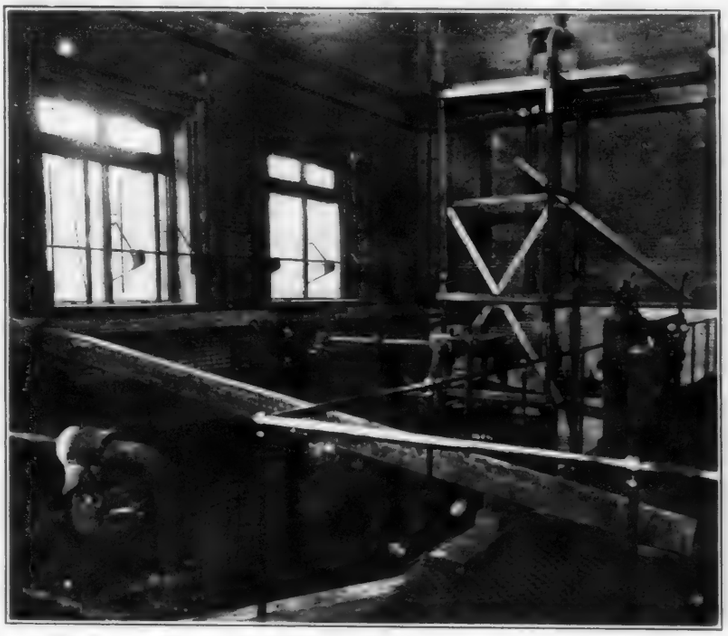
I am not in favor, nor can I see any good reason for having a different method for welding low-pressure piping from that employed on high-pressure piping, although the consulting engineer undoubtedly is more exacting on high-pressure piping by requiring, in many cases, a practical examination for the welding operator, prior to permitting him to do the particular job, and generally requiring the welding operator to have from one to two years' actual pipe welding experience.

The question of the cheapness of welding, as against the use of screw and flanged fittings, is decidedly an open one. My personal opinion is that welding, as a rule, is not cheaper, and in no instance do we recommend it as being cheaper. Our policy is to sell welding on the basis of reduced cost of maintenance and repair, lighter weight, strength, permanency and efficiency. I have succeeded in getting permission to weld a piping installation, in a number of instances, where I knew beforehand that it would be more expensive. The difference in cost, however, was not material, and we were glad to pay for the opportunity to prove the merits of welding to the consulting engineer. We did not, and do not, hesitate to add our contribution to those whose co-operation we must have in order to be successful, knowing that it has decided educational value and will bring us ample return in due time.

Gauge Side of Plug for Testing Partially Installed Pipe Lines

Another problem to be considered is the value of the oxy-acetylene weld as against the electric weld. Many of us are at odds on this question, and it should receive careful consideration. There may be room for both, but at the moment we use the oxy-acetylene process exclusively.

The question of the cost of welding is wide open to opinion and criticism. We differ in method and necessarily must differ in costs. A contrasting example is the comparative cost of placing a cast-iron flanged tee in a main pipe run, as



Welded Piping in Municipal Pumping Station, Baltimore, Where Even the Pipe Bends of 5-In. Extra Heavy Pipe Were Field Welded

against the more or less easy operation of welding in a nipple. The saving, in most instances, is shown to be close to 100%. This is misleading because the admitted saving on this particular operation in no sense is representative of the cost of welding the total installation. For this reason, I hesitate to broadcast my costs, or to subject them to comparison until such time as we all are doing our welding by some accepted uniform practice.

From the foregoing it is but reasonable to assume that we, in the piping industry, must begin at once to correct the present chaos, and to create and adopt standards both as to specifications and materials. Equipment manufacturers and material manufacturers are anxious and willing to give us their co-operation. They realize the necessity for standardization and the architects and consulting engineers certainly desire welding specifications that are supported by a uniform practice adopted by our national association and all of its members.

Master Plumbers Hold 46th Annual Convention at Memphis

An investigation into the advantages and cost of maintaining a permanent headquarters is to be made by a committee of the National Association of Master Plumbers and the findings presented to the state conventions of the organization during the coming year. This move was initiated at the 46th annual convention of the association held at Memphis, Tenn., June 19-21.

Among other recommendations, President Nolan suggested that a bill similar to the old Taggart Bill be prepared for introduction in Congress, to provide for the separation of plumbing and heating from the general specifications on all Federal buildings. Commissioner William J. Flynn, of New York City, appealed for closer co-operation between the Heating and Piping Contractors National Association and the Master Plumbers, it being his belief that the two industries are so closely allied that the one cannot succeed without the other.

A resolution was presented that the association voice its protest against the character and scope of the national advertising campaign of published estimates of a unit price on house-heating installations, as such estimates, when published, give the public a misleading idea as to the actual cost of a guaranteed house-heating system.

Radiator heat was the feature of one of the two windows of a model plumbing and heating store exhibited by the Plumbing and Heating Industries Bureau. A radiator unit occupied a space against the back of the window. In the corner a floor lamp threw a soft light on an end table. Beside the table an attractive chair completed the furnishings of the inviting room, while on the floor a placard called attention to the coziness and comfort of radiator heat.

Model Store of the Plumbing and Heating Industries Bureau at the Memphis Convention, National Association of Master Plumbers

A. P. H. A. Appoints Committees

American Public Health Association, in naming its committees for the current year, has designated as chairman of the committee on ventilation Dr. Louis I. Harris, commissioner of health of New York City. The committee includes Thomas Duffield, executive secretary and director of field studies, New York Commission on Ventilation; Joel I. Connolly, chief sanitary engineer, Chicago Department of Health; Leonard Greenburg, member of the United States Public Health Service, Industrial Hygiene Section; Dr. C.-E. A. Winslow, professor of Public Health, Yale University, and chairman of New York Commission on Ventilation; Dr. S. Josephine Baker, formerly director, Bureau of Child Hygiene, New York, and Charles H. Keene, director of physical education, Buffalo University.

The function of this committee is "to study the relationship of ventilation to health particularly in schools," and it is of particular interest in view of the classic resolution that was "railroaded" through the A.P.H.A. convention condemning mechanical ventilation that this committee is headed by an outspoken advocate of open-window ventilation and includes Dr. C.-E. A. Winslow, who assumed the leadership of the open window cult during his presidency of the association, Dr. Leonard Greenburg, an ardent disciple, and others whose leanings are more or less pronounced on this subject.

Conference Approves Standards for Steel and Wrought-Iron Pipe Nipples

Approved commercial standards for pipe nipples specify that they shall be made only from tested, new, full, or short lengths and full weight steel pipe, free from buckles, bends, cracks, kinks, or any defects which might affect its strength or serviceability. For steel pipe nipples, the pipe shall otherwise conform in all respects with the A.S.T.M. tentative specifications for welded and seamless steel pipe, while wrought-iron pipe nipples shall be in accordance with A.S.T.M. specification No. A72-27.

A general conference of manufacturers of pipe and pipe nipples, distributors and users of pipe nipples, agreed on these standards at a meeting held under the auspices of the commercial standards unit, Bureau of Standards, held June 29, at the Department of Commerce. I. J. Fairchild, head of the commercial standards unit, stated that, before printing the standard, the industry will be circularized to receive signed acceptances from at least 65% of annual production by volume, as well as a majority of distributors and users.

Committees are to be appointed to review the standards annually, to make corrections or changes. The A.S.H. & V.E. has been invited to appoint a representative to serve on these committees. The conference also voted unanimously for the adoption of the certification plan of the Bureau of Standards. Under this procedure, the manufacturer of the nipples, upon request, will certify to the purchaser that his commodity is made in conformity with the approved commercial standards.

How Would You Do It?

Question No. 12

What horsepower motor and what energy consumption per 24-hour day will be required to circulate 1500 gal. per min. in a forced water-heating system having the piping sized on the basis of 1-lb. drop in pressure per 100 ft. of pipe run if there are

12 8-*in.* 90° *ells*
6 6-*in.* 90° *ells*
20 4-*in.* 90° *ells*
10 3-*in.* 90° *ells*

and the actual length of run is 2000 linear feet?

IN order to compute the electric current required to circulate 1500 gal. of water through the system, it is necessary first to compute the total friction head against which the pump has to work. This is determined by the quantity of water to be circulated, the size of the pipe and the length of run. After finding the total friction which will be developed under the conditions existing, the theoretical horsepower is computed easily.

The problem states that there is a total run aggregating 2000 lin. ft. and that the pipe has been sized on the basis of 1 lb. drop per 100 ft. of run. The friction lost in the straight pipe then is found by multiplying the drop per 100 ft., by the total run divided by 100 or

$$1 \text{ lb.} \times \frac{2000}{100} = 20 \text{ lbs. drop in straight pipe.}$$

Fittings, however, offer an added resistance which also must be overcome, this resistance usually being given in terms of the number of feet of straight pipe which would offer the same resistance when handling the same quantity of water. These equivalent lengths vary somewhat as given by different authorities but, to illustrate the principle of calculation here, the following amounts will be taken for the basis of figuring:

Equivalent length of straight pipe equal to 1-90° ell.

Size of Fitting In. Diam.	Equiv. Ft.
3	12
4	18
6	30
8	40

It will be noted that it takes a greater length of pipe to equal the friction in a large fitting than it does for a smaller fitting. This is because the larger pipe has a smaller friction loss, thus requiring a greater equivalent length.

Then, with these equivalent lengths, the amount of run which would have to be added to the straight pipe in order to have the total friction equal the sum of that built up by the pipe and fittings would be

No. of Fittings	Fitting	Equiv. Length	Total Equiv. Length
10	3-in. ells	@ 12 ft.	120 ft.
20	4-in. ells	@ 18 ft.	360 ft.
6	6-in. ells	@ 30 ft.	180 ft.
12	8-in. ells	@ 40 ft.	480 ft.
		Total	1140 ft.

The friction loss in pounds will be:

$$1 \text{ lb.} \times \frac{1140}{100} = 11.4 \text{ lbs.}$$

and the total friction is

In pipe .....20 lbs.
In fittings .....11.4 lbs.
Total .....31.4 lbs., or

$$\frac{31.4}{0.43} = 73 + \text{ ft. of head, or, say, approximately 75 ft.}$$

This shows that the pump will have to move 1500 gal. per min. against a total friction head of 75 ft. which is

1500 (gal. per min.) x 8-1/3 (lbs.) x 75 (ft.) = 937,500 ft. lbs. per min. and, to reduce foot pounds to horsepower it is necessary to divide by 33,000 ft. lbs. per min., so we get

$$\frac{937{,}500}{33{,}000} = 28.4 \text{ H. P.}$$

This, however, is only theoretical horsepower as the pump is a device which is not 100% efficient. In fact, only about 72% of the power delivered to the pump shaft is developed by the pump into useful power to move water.

If the net power to move the water through the line is 28.4 H.P. and the efficiency of the pump is 72%, the actual power applied will have to be

$$\frac{28.4 \times 100}{72} = 40 \text{ H. P.}$$

and, as there are 746 watts per horsepower the net motor output would be

$40 \times 746 = 29{,}840$ watts or 29.84 K.W.

But the motor itself is not 100% efficient, so we must allow for this.

On this size of motor the efficiency might be 90% so the input would be:

$$\frac{29.84 \times 100}{90} = 33.2 \text{ K.W.}$$

In a 24-hr. day the energy consumed would be:

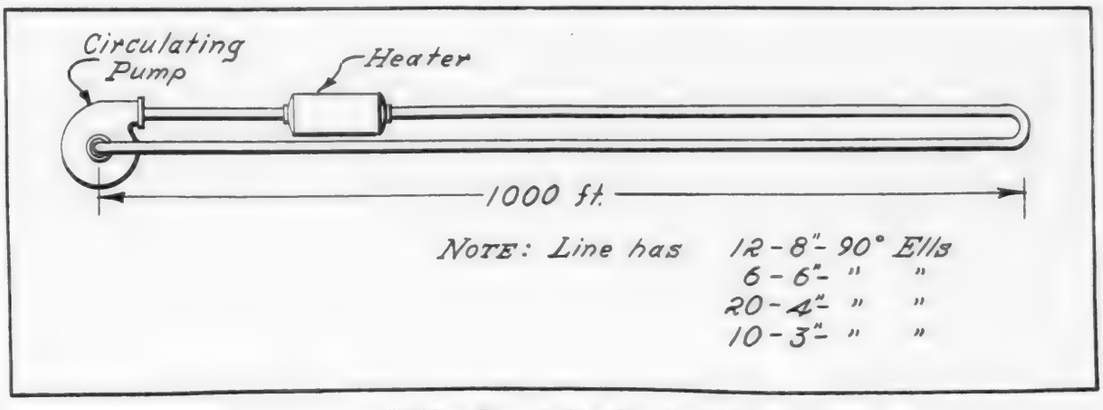
$33.2 \times 24 = 796.8$ K.W.H. per day.

The motor selected probably would be 50 H.P. to allow for contingencies.

PROBLEM FOR NEXT MONTH

Question No. 13

Will it require more or less steam at 2 lbs. gauge to heat 500 gal. of water, in a steel tank without covering, in one hour than in three hours? Assume the water temperature rises from 60° F. to 200° F. during the heating period; that the tank is 42 in. diameter x 7 ft. long, weighs 980 lbs. and that the room temperature rises from 60° F. to 80° F. owing to the radiation from the tank during the heating-up period.



Problem Presented in Question 12

Health and Ventilation

By Peter H. Bryce, M. D.

6. Ventilation of Passenger Coaches

Photo by Ewing Galloway

De Luxe Limited Train Showing Arrangement of Monitor Roof Ventilators

IN the very nature of the case, the problem of ventilating railway cars always has been a difficult one. Unlike the stationary building, the car, as part of a train travelling many miles an hour, creates air currents, apart from the wind, that prevent the application of any ordinary rules dealing with constants. Hence, any attempts to solve the problem of car ventilation have been empirical and any satisfactory results have only been the result of experiment. Yet the demands of the situation have been so great that much attention and thought have been given to the matter, and some quite successful attempts have been made to resolve the difficulties.

As in the case of a house, the passenger car of today is built with an iron framework, for strength and endurance, and its carpentry and joining work illustrates some of the finest products of the art. The steel structure has its outer and inner steel sheeting, and windows with double sashes accurately fitted into frames made to withstand the roughest usage, resisting all except frontal attacks. The floors are equally well made to insure strength and warmth, while the clerestory of the roof is fitted with movable windows for ventilation. Usually, in addition, each car has in the roof at least two automatic stationary ventilators about 1 ft. in diameter, which may act as outlets whenever the interior air pressure is increased.

NO STATE LAWS REGULATING AIR SPACE

State laws usually have not regulated the amount of air space, although practice in America allows about 100 cu. ft. of air space per person, or more than a steamship cabin. Although abundantly supplied with windows, these are double to protect against cold and dust, and, while much used in warm weather to relieve the stuffiness of a closed, often over-heated space, the windows in no sense are intended as ventilators; moreover, the frequent opening of doors allows blasts of outer air to enter to the discomfort of the passengers. Clearly a passenger car, at most, is a temporary place of abode. Under modern improvements, as in a Pullman, it is made relatively comfortable through increased airspace, and through the ministrations of a porter who is supposed to regulate the heat, but which, however, generally is in keeping with the negro's own tropical temperature.

IMPROVEMENTS IN AUTOMATIC STATIONARY VENTILATORS

It has been mentioned that stationary ventilators on the roof of the car act as outlets for foul air, assisted by adjustable windows in the clerestory. The ventilators usually are opened toward the rear to prevent smoke and cinders from entering, and often act as vents for foul air. Some improvements in the automatic stationary ventilators have been made by utilizing a stationary siphon ventilator, and, still better, by a rotary siphoning cowl, or a combined siphon and movable cowl, to act as an ejector, the ejector inlets being directed into the wind, while the outlet of the cowl is directly away from the wind.

Obviously, the success of such methods is measured by the rate of the movement of trains and the direction of the wind, with the amount of fresh air permissible in keeping with the outside temperature. As the fresh-air windows in the upper part of the car usually are opened, persons sitting near soon demand their closure, so that we are forced to the conclusion that in practice car ventilation is still in its primary stage.

NEED FOR AUTOMATICALLY-OPERATED DEVICES

Clearly then, what is demanded is some apparatus, which, in practice, will operate automatically, just as mechanical ventilation does in connection with the heating of a school or other large building. To this end the energies of manufacturers of ventilating fans have been directed with more or less satisfactory results. It is evident that the method of steam heating from the engine has been a very great step in advance in the heating of railway cars, so necessary in northern climates; but the dust from the road-bed in the dry west and much-travelled roads equally demand some scheme which will introduce outer fresh air without its accompanying dust.

THE GARLAND SYSTEM

The modern steel structure of cars has been utilized in providing a means of introducing fresh air from a galvanized duct beneath the car, and through an inlet from it opposite each sleeping berth, with its shutter regulated by the inmate. Such an apparatus has been made by the B. F. Sturtevant Company being operated in connection with a Garland ventilator in the clerestory of the car and is a definite contribution to the solution of this difficult problem. The literature on the subject, however, leaves the matter still in an unsatisfactory state, since, while it applies the fan to heated and washed air, it gives no indication of how this part of the problem is to be worked out.

Obviously, in order to solve the problem we have to know the several factors, based upon the laws governing ventilation in other structures, and to realize that a proper temperature must be associated with an average humidity of 50%, with the assured introduction of fresh air supplied by an electric fan at a definite rate. Adopting an ordinary Pullman car with its twelve berths, a smoking room and a stateroom, as our standard, we have approximately an air space of 4000 cu. ft. to deal with and 30 persons to be made comfortable, with fresh, clean, warm air at a proper humidity.

STEAM AND ELECTRICITY AVAILABLE

To assist us in our efforts we have two principal factors: first, steam from the engine for heat, and, second, electricity to operate a fan. Dealing with the heating first, it is obvious that the present direct steam heating system may be allowed to remain in the car, but rather as an auxiliary. The work to be done means an approximate change of air in the car, having a movement of, say, 2 ft. per second. With an inlet duct of 2 sq. ft., with adequate openings, each person would be supplied with 500 cu. ft. of air per hour; but, with double the rate of air movement, each person would be supplied with 1000 cu. ft. per hour. Under the circumstances this amount would fulfill most sanitary requirements.

It would seem reasonably possible, without burdening the car with appliances, to utilize, as is done in large buildings, a portion of the steam from the engine to heat air by passing it through a multitube copper radiator in the space at the end of the car. The steam would pass through the tubes, just as it does through the tubes used to heat the water surrounding the tubes in the jacket, as seen in central heating systems to-day, when the house heating is by hot water. Obviously, the work to be done, just as in any other heating system, will depend upon the degree of cold in the outer air. Fortunately, we have the physical fact that air at zero holds only 0.5 grains of water to a cubic foot, so that the high specific heat of the moisture in outer air at zero is a negligible quantity.

Luckily, too, the dust problem in northern climates in winter, when most heat is required, does not enter into the problem to any important degree; but clearly, apparatus must be provided whereby the incoming air drawn from above shall enter the car as free as possible from dust particles.

In a previous article reference was made to the amount of carbon particles in the smoke from railway steam engines, and it is apparent that improving the combustion of coal will notably assist in lessening the amount of dust which will enter the cars. However, the filtering of the incoming air must be deemed essential, and in this it would be possible to utilize the splendid experimental work of Anderson Armspach, which can be utilized both in filtering the air and in supplying moisture.

A SUGGESTED DESIGN FOR A CAR-HEATING AND AIR-CONDITIONING UNIT

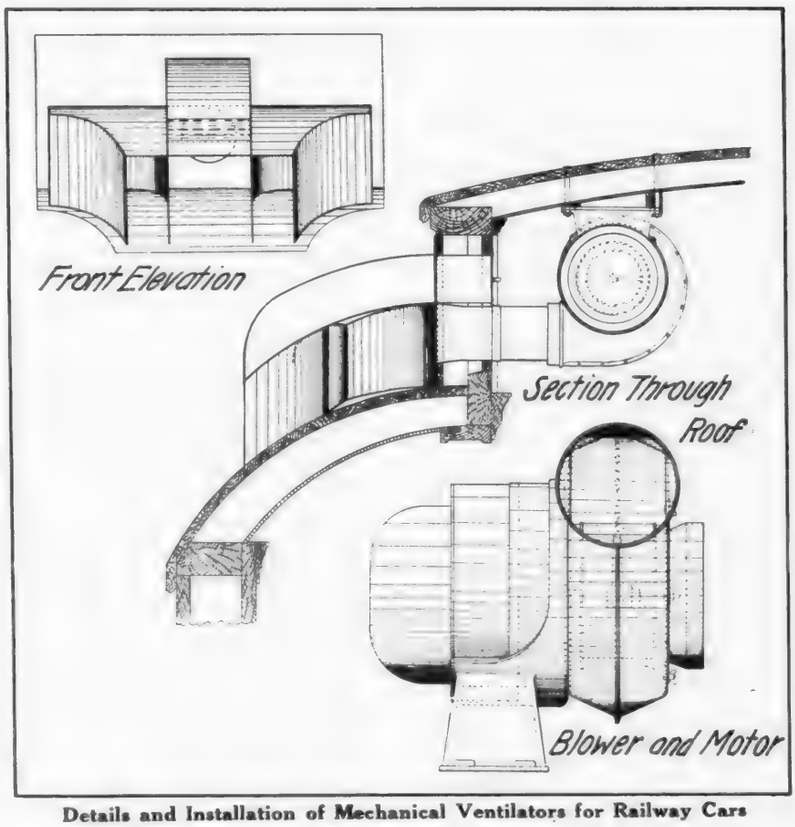
The following installation is submitted for criticism to those interested in the subject and as worthy of consideration. In the rear corner of the car, usually dedicated to brooms and other impedimenta, it is proposed to place a sheet-steel box duct, directly connected with the outer air above the roof of the car, the opening of the duct being directed at an angle away from the engine. Within the steel box sufficient space is allowed to place a ready-to-run motor and fan and a steam heater. There is also a space below with a pan to collect the condensed steam and from which an opening directs the fresh washed and heated air to the duct, along the inside of the car at the floor. It might seem natural to place screens with muslin cloth in the duct to intercept the dust; but we fear that the frequent changing of these, which soon become clogged, would not interest the ordinary car attendant; hence something more automatic and not requiring changing is demanded. We must turn, therefore, to the steam pipes beneath the car for a source both of heat and of means for washing the air.

Remembering that to supply 500 cu. ft. of fresh, warm, clear air for each of the 30 people in the car is our problem, it does not appear, at first sight, a serious one, and is not, if we can coordinate its factors. The subjoined diagram represents a section through a box-duct of 18 in. square, connected with the outer air, within which are placed a small motor and fan capable of introducing at least 50,000 cu. ft. of fresh air per hour.

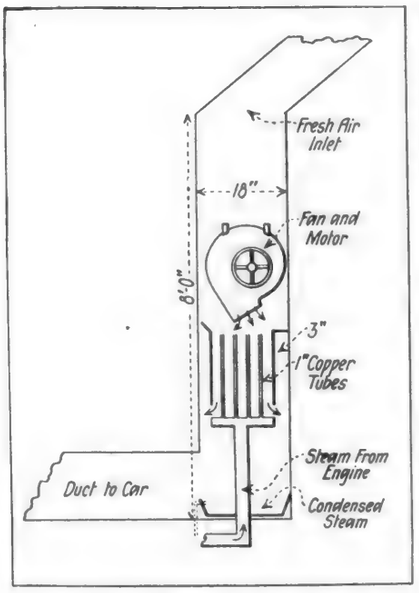
HOW THE SYSTEM WOULD OPERATE

As will be seen from the diagram, the incoming air at once meets steam at, we may suppose, 5 lbs. pressure per square inch, issuing from sixteen open copper tubes of 1 in. diameter, contained within a steel box, 12 in. square, with a space 4 in. wide, all the way around at the bottom as an outlet for the heated and washed air which has passed down between the sixteen copper tubes.

It will be seen that a 3-in. space surrounds the inner steam chest which has a by-pass at the top, on one side, for admitting cold air. This by-pass damper can be operated from the car. The untreated air, moreover, will meet condensing steam in the space below the steam chest and thus be washed free of its dust particles, which will settle into the condensed water pan.



Details and Installation of Mechanical Ventilators for Railway Cars



How a Passenger Coach Might Be Supplied with Properly Conditioned Air

The position of the steam pipe from the engine as it passes to the steam chest is seen, while around it is a pan with an overflow to receive the condensed steam and dust particles. This lower chamber connects with the duct located along the inside of the car, or if practicable, below it, from which outlets deliver the fresh, clear, properly humidified air to the several berths.

Some of the physical facts entering into the problem may be referred to. For instance, outer air at zero will enter the duct with its capacity for moisture equal to only ½ in. per cubic foot, and when its temperature rises to 70° F. its capacity for moisture will be increased sixteen times. When air is at zero, 1 lb. of steam at 15 lbs. pressure will heat some 900 cu. ft. per minute to 70° F., or, in other words, the amount of steam delivered through the sixteen 1-in. pipes in the steam chest, at 15 lbs. pressure, will heat, in an hour, over 100,000 cu. ft. of outer air from zero to 70° F. Further, 2 lbs. of steam, if condensed by cold air, will have its volume reduced from 300 to 50 sq. in. and hence give ample opportunity for the incoming air to pass downward with the condensed steam. The fact that only 500 cu. ft. of saturated air at from 70° to 90°, will enter the car per minute makes it obvious that the amount of humidity entering presently will be diffused in the 4000 cu. ft. of car space. By lessening the inflow of both air and steam, the relative humidity can be prevented from exceeding 50%.

However imperfectly the proposed scheme may prove in experience, the writer feels that at any rate he has dealt with most of the factors entering into the problem. The principle of applying known laws of physics has been applied throughout, supplying in some measure a constant to the difficult problem of a rapidly-moving train. It is confidently hoped that the method proposed will prove a step forward in supplying railway trains with clean, fresh, warm air of the proper humidity.

"Tower Buildings" Use District Steam

In cities like New York where tower buildings loom up, some over fifty stories high, the cellar or foundation area is so small that every foot of space must be conserved for necessary utilities, which cannot conveniently be housed on upper floors, such as restaurants, kitchens and storage. In these buildings there is no room for mechanical equipment, other than that absolutely necessary, unless sub-cellars are provided by excavating, often in rock, and running down foundations and steel work far below the street surface, involving large initial investment, and almost prohibitive subsequent carrying expenses.

The New York Steam Corporation, New York, reports the following modern tower buildings, up to fifty-two stories high, which have been completed within the past year or two, or which are under contract for construction, where the company's steam service has been adopted and where heating plants have been omitted from the building construction. The volume of these buildings totals approximately 96,000,000 cu. ft. with a rentable floor area of about 4,800,000 sq. ft.

Chanin Tower Building
Arnold-Constable Building
Lefcourt National Building
Sherry-Netherland Hotel
Harriman Bank Building
International Telephone Building
Savoy Plaza Hotel
Lincoln Tower Building
Transportation Building
Fred F. French Building
The Bank of United States Building
Chase National Bank
New National City Bank Building
Salmon Tower
General Motors Building

Steam Fitters and Plumbers Meet at Texas A. & M.

Planned to increase the efficiency of the operator, to appeal to any business man, and to have manufacturers' exhibits described by their representatives, the first annual conference for plumbers and steam fitters was held at the Agricultural and Mechanical College of Texas, College Station, Texas, July 18-20.

Dr. F. E. Geisecke, in lectures and laboratory demonstrations, explained the design of water supply and water heating installations and the method of determining the friction in pipes and fittings. Estimating costs of plumbing and heating installations was the subject of a discussion by Prof. S. E. Dibble. The importance and economy of welding pipes for heating and plumbing installations was explained by E. Gregis, of the Linde Air Products Co., and A. L. McClurg addressed the conference on the correct installation of steam-heating systems, and again on salesmanship as applied to the plumbing and heating industries.

Although this was the first effort, about twenty-five men attended and those in charge were well pleased and look forward with confidence to a material growth in the attendance at future conferences.

The names of those attending the conference, as shown below, are: Top row, T. E. Gossett, E. W. Steel, A. L. McClurg, F. R. Juergens, F. E. Giesecke, B. E. Howell, B. Dimock, C. D. Hughes, J. Blasienz; bottom row, V. M. Ehlers, C. E. Greer, E. J. Evans, W. R. Stewart, D. S. Hill, S. E. Dibble, F. W. Wells, B. W. Hartigan.

Instructional Force and Lecturers, First Annual Conference for Plumbers and Steam Fitters Held at the A. & M. College of Texas, July 18-20

Legal Decisions

Right of Conditional Seller to Tenant of Furnace and Pipes Installed with Property Owner's Knowledge to Remove Them

A tenant at will of a house contracted with a furnace company for the installation of a hot air furnace on conditional sales contract, the title to be in the furnace company until the furnace was fully paid for, with the right to remove it in default of payment. Only one installment was paid before the tenant gave up possession of the house. The furnace was installed upon a cement floor in the basement, and partly cemented in the base or ring of the furnace; the contractor put in hot and cold air flues or pipes, and hung these on the overhead floor joists by nailing strips of tin to the joists; and connected the furnace with a hot water tank by running a pipe or pipes from the tank to a coil in the furnace, all in the basement. Some of the pipes had asbestos coverings.

In an action of replevin in the Minnesota courts by the furnace company to recover possession of the furnace, casing, hood and pipes, the evidence sustained and probably required a finding that the owner of the house consented to and directed the installation of the furnace by the tenant. He was not in the position of a subsequent purchaser or mortgagee without notice of the furnace company's contract rights. Even if the furnace were considered a fixture in the ordinary sense, the owner of the house was not in a position to reap the benefit thereof in disregard of these contract rights where the furnace could easily be removed without material injury to the property.

The rule that, as to a prior mortgagee, annexations made to the realty, to which the mortgagee or owner never acquires title and which may be removed without material injury to the realty, do not become part of the realty and may be removed by the one owning them, applies also as to property annexed under a conditional sales contract.

The conditional sales contract was properly received in evidence to prove that the furnace and attachments were chattels and subject to removal, and to prove the furnace company's title thereto.

The court admitted that conflicting decisions from other states might be found, but it followed the law as shown by the decisions of the Minnesota courts.

It distinguished the case of Des Moines Improvement Company v. Holland Furnace Company (Iowa) 212 N. W. 551, where an assignee of the vendee of a house under conditional sales contract went into possession and without notice to the conditional vendor of the house installed a furnace under a conditional sales contract. The vendee defaulted in his payments, and the court there held that the furnace, having become part of the realty "without the knowledge or consent, express or implied," of the conditional vendor of the house, the seller of the furnace could not remove it.—Holland Furnace Company v. Jefferson, Minnesota Supreme Court, 216 N.W. 795.

Heating Plant Contractor May Sue on Quantum Meruit Instead of on Contract

Separate contracts were made between a contractor and a lot owner. one for the construction of a building on the lot and the other for the installing of a heating plant in the building. The contracts having been completed and the work accepted by the owner, and nothing remaining except the payment of the money, it was held, Wilson v. Mattei, California District Court of Appeal, First District, 258 Pac. 453, that the contractor was authorized to maintain an action based on the doctrine of the common courts for the value of the materials furnished and labor performed, instead of suing upon the contracts. Under such a form of pleading, the contracts were competent evidence on the trial as an admission of the standard of value or as proof of any other fact necessary to the recovery.

Where Conditional Vendor of Property is Without Knowledge of Furnace Installed on Conditional Sales Contract with Vendee

A house and lot was sold to P. on conditional sales contract. Thereafter a furnace company sold P. a furnace on conditional sales contract and installed it on a concrete base constructed therefor and to which it was permanently attached. Hot air pipes and registers were installed in the usual way. The vendor of the house knew nothing about the furnace until after it was installed. The vendee defaulted on both his contracts and surrendered possession. The furnace company took out a writ of replevin and removed the furnace. The vendor of the property demanded its return or its value and the cost of installation, and sued the vendee therefor, the furnace company intervening. The Iowa Supreme Court held, Holland Furnace Company v. Pope, 215 N. W. 943, on the authority of Des Moines Improvement Company v. Holland Furnace Company, 212 N. W. 551, that the vendor of the property, who elected to take a money judgment, was entitled to recover the value of the furnace, the cost of putting the property in the condition it was in before the furnace was installed, and interest from the date of its removal.

Proof of Contract with Partnership for Heating Installation

In an action for labor and materials furnished in the installation of a heating and plumbing system in a garage which had been newly constructed, the defendants, members of a co-partnership, contended that no contract for the work or materials was ever entered into between the plaintiff and the partnership. The negotiations with the plaintiff for the plumbing and heating were conducted by M., one of the partners, and resulted in the performance of the work and the furnishing of the materials substantially as claimed by the plaintiff. The garage thus equipped was occupied by the partnership, and the defendants had never made full payment, claiming that part of the heating system was defective and unsatisfactory. It was held, however, Shaughnessy v. Murphy, Massachusetts Supreme Court, 158 N.E. 665, that the jury, to whom the case was properly submited, well could find, even if the other partner, E., testified that "he had nothing to do with the negotiations," that the equipment of the garage was for the sole use of the partnership in carrying on the joint business, and that the contract was not negotiated for the benefit of M. individually. Judgment for the plaintiff was therefore affirmed.

Oil Burner Dealers in Montreal Form Association

Dealers and manufacturers of equipment and supplies, used in the production of oil heat, recently formed an organization to be known as the Oil Heating Association of Montreal.

John T. Lewis, of Lewis-Brown, Ltd., was elected president for the ensuing year.

Fundamentals for the Oil-Burner Dealer

AN able, concise and comprehensive analysis of the factors entering into successful oil burner sales recently appeared in "Electrolites," house organ of Electrol, Inc., of Missouri. This article, by Charles W. Roth, of Electrol, Inc., is well worth careful study, not only by those engaged in oil-burner sales, but by those engaged in selling heating or ventilating equipment in a retail way. Mr. Roth's article follows:

"Some of our dealers have been in the oil-burner business long enough to know something about the many factors which have to be considered in computing costs and figuring profits. We receive letters from time to time asking for information on and suggestions as to accounting and business guidance in general, and the difficulty that seems to form the basis of most inquiries is the problem of 'costs.'

"If this important factor in business were clearly understood and kept under constant observation by all who deal in oil burners, competition would lose its terrors and some real profits would be the rule where now they are the exception.

"When all is said and done, in any line of business, the number of dealers who know their costs in a definite way and can lay their plans accordingly are in the minority. This is especially true of those newly entering the field and to new Electrol dealers we offer every assistance that our experience qualifies us to give.

"Many excellent dealers are too engrossed with selling burners and installing them to give much thought or study to the kind of analysis and the kind of planning that is characteristic of what we call a good business man.

"The following is about the way a man of business experience would think, reason and act in working out his plans for success in oil-burner selling:

1. How many burners of all makes can be sold in the territory in a year's time?

2. How many different burners constitute my competition?

3. Considering merit and price, what number can I expect to sell?

4. If I sell this number and meet price competition in my class what will my gross profit be?

5. Can I conduct a successful business on this gross profit throughout a year's period of operation, taking into consideration all expenses as follows:

I. Fixed and constant:

1. Rent
2. Heat
3. Water
4. Light and Power
5. Phone
6. Salaries
   (a) Executives
   (b) Clerical
   (c) Mechanical
7. Insurance
8. Trade association dues
9. Allowance salesmen's cars
10. Depreciation on tools, equipment and motor vehicles
11. Taxes and licenses

II. Variable:

12. Stationery
13. Postage
14. Printing and advertising
15. Telegrams
16. Traveling
17. Interest
18. Legal expense
19. Credit losses
20. Automobile (truck and service)
21. Freight and express (miscellaneous)

III. Proportional:

22. Finance charges or cash discounts
23. Sales commissions
24. License, permit or inspection fees
25. Freight on burners
26. Drayage on burners
27. Storage on burners

IV. Miscellaneous:

28. Sundry shop expense
29. Unusual and unforeseen expense

"Items 1 to 11 can be quite accurately determined and their sum total for the year represents the first goal to be gained in building sales volume.

"Items 12, 13, 17, 19, 20 and 21 will vary, but are somewhat proportional to the amount of business done.

"Items 14, 15, 16 the dealer can control in a more or less arbitrary way. Nos. 14 and 16, however, have more effect on the volume of business than the volume of business has on them.

"Items 22, 23 and 24 run at so much for each burner sale and do not occur unless sales are actually made, whereas items 25, 26 and 27 can be created merely by purchasing and taking delivery of burners regardless of whether they are sold or not.

"Item 28 results from the odds and ends bought and used up around a shop and item 29 can be anything that involves an expenditure of unusual and unforeseen character.

"Before questions 4 and 5 can be adequately answered the anticipated sales volume must be classified if the dealer expects to conduct business through sub-dealers and the classification would show estimated gross profits from:

1. Sales of burners to sub-dealers
2. Sales of burners installed in homes
3. Sales of parts to sub-dealers
4. Sales of burners and service to home owners

"Our business man, at this point, has before him the best that judgment can offer as to what he must strive for in the way of gross profit.

"His next step is to determine how the various costs and expenses must be computed on a per burner or a per part basis and it is this procedure that will tell him what liberties he can take with 'Selling Price' and what he can do to keep in line with competition, and just what the effect will be on 'Profits.'

"The price of sales to sub-dealers will be made up as follows:

1. Burner or parts cost
2. Freight or express inbound
3. Drayage charges, if any
4. Storage—if warehouse facilities are used
5. A percentage of items 1 to 6-b, inclusive, 7 to 21, inclusive, and 28 and 29
6. Profit

"The price of a completely installed job would be built as follows:

(a) Burner cost.

(b) Material cost.

(c) Labor cost. This is a repayment in part for expenditures under item 6-c, but is regulated by the actual requirements of each particular job and not in proportion to the number of burners sold in a year's time, as is the case with

(d) Overhead cost—being a portion of expense items 1 to 6-b, 7 to 21 and 28-29, said portion being regulated by the number of burners sold in a year in such a way that all of the moneys expended in these items and also a possible residue of 6-c will come back in the gross profits.

(e) Proportional costs—items 22 to 27, inclusive, as determined for each retail burner sale.

(f) Service reserve—another portion of item 6-c estimated to take care of any labor and material needed to service burner during guaranteed period.

(g) Profit—this is an elastic item and it will be found necessary to reduce it or expand it according to competitive conditions, making due allowance for taking care of the preceding cost items.

"A dealer who approaches the oil-burner business as a new undertaking, and will study the possibilities and the procedure as outlined, will come nearer to making a go of it than the man who tackles it in a haphazard manner. It is needless to say also that a year or two of oil-burner experience will give a dealer most valuable data which he can arrange according to the methods shown and in doing so approach the coming year with a greater feeling of certainty as to the outcome. He will know where he wants to go—where he is at any stage of the journey—and what his chances are of reaching destination."

Correspondence

Conducted by T. W. Reynolds

Proper Connections to Radiators Located Below the Steam Main

EDITOR HEATING AND VENTILATING MAGAZINE:

Are one-pipe connections, as shown in Fig. 1, correct; in other words, should valves be used on the return branches to prevent steam from entering the radiators from the return main?

Altoona, Pa. D. L. M.

It matters not if steam does enter the radiator from the return end as the steam has only one entrance to the radiator — the same entrance as the steam from the supply branch; consequently there will be no counterflow of steam.

One-pipe connections, as shown in Fig. No. 1, are the simplest and least expensive form of connections. They give no trouble whatsoever, whereas the two pipe connections, as shown in Fig. 2, which is probably the remedy the correspondent has in mind, are likely to short circuit, holding up of water, air binding and water hammer.

Connections as shown in Fig. 2 sometimes are required where the main is below the radiation which it supplies. Check valves then are used at each radiator to prevent steam, which may travel faster by one route, from entering some other radiator by way of its return connection, thus closing the air valve of the last mentioned radiator before all air from this radiator has been expelled. This often happens where steam, heating up a small radiator, first passes into the return and backfires or short circuits into a larger radiator. Air in the large radiator then is caught between the steam advancing by different routes, becomes pocketed, and the radiator is thus air bound and rendered ineffective in such portions as contain air. Water hammer also may result.

Check valves cause a pressure drop in the system, some more than others, and the pressure of steam in the return may cause one of them to remain closed for a time and hold up water, or they may lodge in an open or closed position. The connections shown in Fig. 2 also are objectionable because closure of the stop valve causes water to collect in the supply drop, above the valve, unless the drop is provided with a direct connection to the return, as shown dotted at radiator No. 1. This trouble may be reduced somewhat by taking the branch connections from the main either off the top of the main, by 90° elbows, or from its side by 45° ells.

Best Location for Air Valve on Tube Radiation

EDITOR HEATING AND VENTILATING MAGAZINE:

It seems to the writer that the location of air valves on the newer or tube types of radiators should be changed, due to the fact that such radiators are rapid condensers. Possibly fast-working air valves would also be of help.

Newark, N. J. R. W. T.

"Fast-working" air valves tend to spit water if they are too "fast." In other words, if their ports are large the radiators heat up fast, producing more condensation in a given time. However, when air valves spit water, generally it is due to the fact that the supply pipe connection is too small.

Comparing tubular with column radiation with reference to the warming-up period, when the rate of condensation is comparatively high, it takes 50% less steam to fill the tubular radiator; hence a given supply pipe would fill the tubular radiator much quicker than it would the column radiator. On the other hand, the tubular radiator weighs less and this would cause a substantial reduction in the total amount of condensation, due to the smaller mass of cold metal requiring warming-up.

There are a number of things that affect the condensation rate, although, after all, any one of these conditions may offset or balance the other. For example, there is the extent to which the interior rubbing surface, in proportion to the volume of steam, tends to retard the steam flow. Also, the total volume of steam required in a given time and the increased velocity of steam flow which might occur where one radiator, having a greater mass of cold metal, would induce such a higher rate of flow, due to the vacuum set up within the radiator.

In the final analysis, the rapidity of condensation does not affect the proper working of the air valve as much as might be imagined, for if it were otherwise there would have been no end of air-valve troubles throughout the years when radiators of variable lengths were equipped with the same sizes of air valves. In such cases the volume of condensation required, as well as the volume of air which had to be vented, was variable, nevertheless the results obtained from the same size and location of air valve on radiators of varying size were not variable.

When one has occasion to observe the warming-up of a radiator he will soon notice by touch of the hand that the rate of heating is constant, section by section. A radiator twice as long as another will not heat up in the same time, but under corresponding conditions will take practically twice as long. From this it will be seen that no matter how long the radiator, the rate of condensation remains the same during the time when flooding of the air valve is likely to occur.

Offsetting Body Heat Output

EDITOR HEATING AND VENTILATING MAGAZINE:

In a paper by Thomas J. Duffield, executive secretary of the New York Commission on Ventilation, published in the *Journal of the American Medical Association* for April 21, 1928, under the heading of "How Much Fresh Air Does a School Child Need?" Mr. Duffield makes the statement that "any system of school ventilation should provide sufficient fresh air at such temperature as will offset the effective heat output of the pupils and maintain the temperature of the classroom within a narrow range of the point found to be most healthful for the pupils."

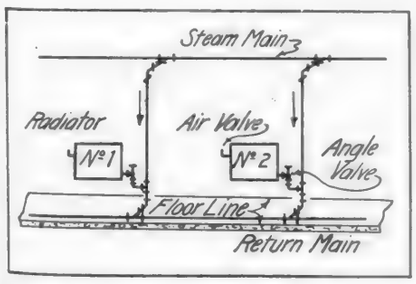


Fig. 1. Proper Connections for Radiators Below Main

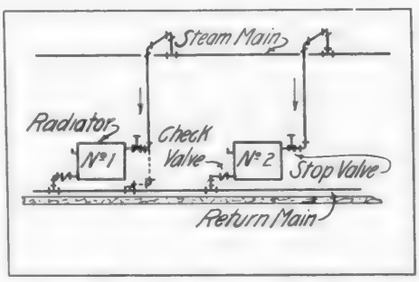


Fig. 2. Improper Connections for Radiators Below Main

Mr. Duffield then proceeds to give a table showing the amount of air at different outdoor temperatures which will be raised to various indoor temperatures by 1 B.T.U. In another table he gives the relative body heat output of pupils at different ages from 7 to 16 years.

He then states: "To determine the amount of fresh air for each pupil per minute required to maintain approximate temperature equilibrium, the number of cubic feet of air raised from the known outdoor temperature to the desired indoor temperature by 1 B.T.U. is multiplied by 75% of the total heat output of the average pupil in the room under consideration."

Mr. Duffield continues:

"Reference to the tables will show that only when the outdoor temperature reaches 55° F. will 30 cu. ft. of fresh air per minute be required to keep the temperature of a room occupied by 15-year old pupils from exceeding 66° F. First-grade pupils require 30 cu. ft. of outdoor air at 60° to keep the room temperature from exceeding 66° F. It is well known that the fans of mechanical ventilating systems in schools are usually shut down long before the outdoor temperatures average 55° and 60° F.

"If these basic data and calculations are correct, it remains for the heating and ventilating engineer to provide, first, the heating plant that will just compensate for the structural heat losses over a wide range of outdoor temperatures, and, secondly, a means of introducing quantities of air varying with the average ages of the pupils and the outdoor temperatures in a manner that will not produce drafts."

I should like to know why it is necessary to counteract the body heat given off by the pupils with cold air from outdoors. Admittedly there is no precise knowledge as to how much fresh air a school child should have to satisfy his physiological needs. Therefore, would not the logical procedure be to reduce the size of the heating plant, or to shut off the heat when the temperature rises to an excessive degree? It seems to me that the open-window advocates are stretching a point when they advocate the admission of outdoor cold air to counteract high room temperatures.

New York D. L. A.

Wall Temperatures During Heating-Up Period

EDITOR HEATING AND VENTILATING MAGAZINE:

The writer's attention has been called to question No. 6 under "How Would You Do It," page 104, February, 1928, issue of THE HEATING AND VENTILATING MAGAZINE.

After reading this over very carefully, I believe that the person answering the problem in question has not studied this situation very carefully, especially in his analysis of the amount of boiler capacity required for a direct radiation system and a unit heater system.

I believe that this assumption of the necessity of heating the building walls to get the room temperature during the heating-up period, is in error. It is practicable and feasible to have comfortable room temperature, even though the building walls and equipment therein are below the temperature of the room. In other words, there is a difference in the method of heating, namely, with the unit heaters we are using the convection principle, while with direct radiation we are not taking advantage of convection.

I know, from tests on the cabinet type of heater, which has become quite popular recently, that the wall temperatures are very much lower than with cast-iron radiation. This can be and has been demonstrated by measuring wall temperatures, using the two types of heat.

It is the claim of fan-blast heating system advocates that it is possible to heat up the rooms much more quickly than with cast-iron radiation. This is partially due, of course, to the more uniform temperature secured between floor and ceiling and also to the use of the convection principle.

I have actually demonstrated, on a number of installations, that the boiler capacity required is not any more with the unit heater type of system than with the direct radiator system. At the same time, there is a decided advantage in favor of the unit heater in the time required for heating up a building.

La Crosse, Wis. R. H. ANDEREGG

The point raised by our correspondent, that less heat is required in a building heated by unit heaters than in one heated by radiators, owing to the rapid circulation of air and the resulting equalization of temperature between the floor and ceiling, is well taken. What Question 6 endeavored to show, however, was that a building could not be heated from a cold condition up to 70° F. in one-half hour with the same boiler horsepower which would be required if the heating-up period were extended to two hours.

In the solution of Question 6 there might be a minor difference, due to the forced circulation of air which is obtained by fans, such as are incorporated in unit heaters. This difference, of course, would reduce the amount of heat required when unit heaters are installed, but against this is the fact that no machinery or stock has been considered in figuring the heat necessary to raise the building to 70° F., the materials of the building construction only having been calculated. If several hundred tons of machinery and partially-fabricated stock, such as would be likely to be found in the ordinary industrial building, were taken into account, the boiler horsepower would have been further increased. For this reason it is believed that the figures presented in the solution given, while not strictly accurate, favor, if anything, the side of the unit heater.

H. L. A.

Philadelphia Market for Plumbing and Heating Material Studied

Dividing the city into economic zones as well as its political divisions, the Plumbing and Heating Development League of Philadelphia has prepared an interesting study of the potential market for plumbing and heating equipment in different parts of the city. Part I of the report of the league, prepared in cooperation with the Plumbing and Heating Industries Bureau, includes a map of Philadelphia showing the location of the 1532 heating contractors and master plumbers. Tabulation of the data presented shows the number of dwellings of one, two, three, or four stories, whether brick or frame, hotels, apartments, and stores in each ward, together with the contractors in that ward. Inasmuch as the sales made and business done in the heating and plumbing industry in a particular locality depend on the economic status of the district, information also is presented showing the number of families in each of 42 different zones together with the average income in each zone. This information was based on a visit to every tenth home.

Sales managers thus can obtain a better conception of the territory where their products can most easily be sold, and they can then secure from the league information as to the type of store or shop owned by each contractor, and thus determine whether sales effort should be expended on him.

National Radiator Corporation will Sell Coatesville Boilers

National Radiator Corp., Johnstown, Pa., has taken over the sale of the steel boilers manufactured by the Coatesville Boiler Works, Coatesville, Pa.

The new branch office and warehouse of the corporation has been established at 1042 Central Industrial St., St. Louis, Mo., in charge of H. G. Hurd.

OIL-FUEL SPECIFICATIONS OF THE A.O.B.A.

(*Continued from Data Sheet No. 48-I*)

Oil No. 2. Furnace Oil—Medium

Scope.....1—This specification covers a grade of distillate oil for use in burners where a high grade fuel is required.

Properties...2—This oil shall conform to the following requirements: It shall be a hydrocarbon oil free from water, acid, grit, and fibrous or foreign matter likely to clog or injure the burner or valves.

(*a*) Flash Point:
Minimum—[1] Legal or (Pensky-Martens Closed Tester) ..... 125° F. or legal
Maximum—(Pensky-Martens Closed Tester).... 190° F.
(*b*) Water and Sediment, maximum..... 0.05%
(*c*) Pour Point, maximum ..... 0° F.
(*d*) Distillation Test:
When 10% has been collected in the receiver the thermometer reading shall not exceed..... 440° F.
When 90% has been collected in the receiver the thermometer reading shall not exceed..... 620° F.

Methods of Testing[2]..3—The properties enumerated in these specifications shall be determined in accordance with the following methods of test of the American Society for Testing Materials, except as specified in paragraph (a).

(*a*) Flash Point:
[1] Minimum—The flash point, instrument and method for determining minimum flash point shall be that legal for the locality in which the oil is sold. In absence of legal requirements the minimum flash point shall be determined in accordance with the Standard Method of Test for Flash Point by means of the Pensky-Martens Closed Tester (Serial Designation D 93).
Maximum—Standard Method of Test for Flash Point by means of the Pensky-Martens Closed Tester (Serial Designation D 93).
(*b*) Water and Sediment:
Standard Method of Test for Water and Sediment in Petroleum Products by Means of Centrifuge (Serial Designation D 96).
(*c*) Pour Point:
Tentative Method of Test for Pour Points of Petroleum Products (Serial Designation D 97-27 T).
(*d*) Distillation Test:
Tentative Method of Testing Gas Oils (Serial Designation D 158-25 T).

[1] In event changes are made in the Methods of Tests by the A.S.T.M. the current Methods of Testing is to be used rather than those mentioned in the specifications.

(*Continued on Data Sheet No. 48-K*)

OIL-FUEL SPECIFICATIONS OF THE A.O.B.A.

(*Continued from Data Sheet No. 48-J*)

Oil No. 3. Furnace Oil—Heavy

Scope.....1—This specification covers a grade of oil, generally known to the trade as light fuel oil intended for general industrial consumption, for use in burners where a medium low viscosity fuel is required.

Properties...2—This oil shall conform to the following requirements: It shall be a hydrocarbon oil free from water, acid, grit and fibrous or foreign matters likely to clog or injure the burner or valves.

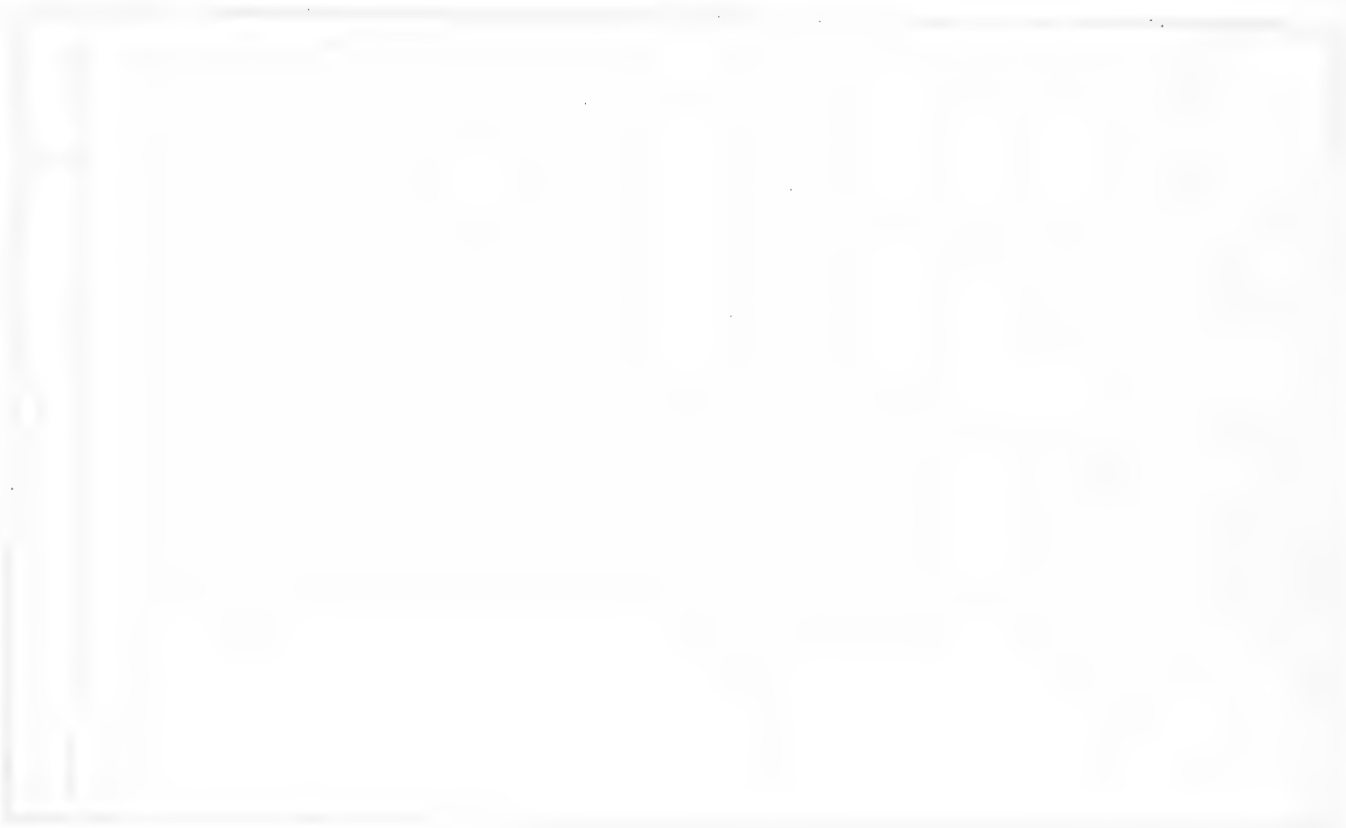
(*a*) Flash Point:
Minimum—1 Legal or (Pensky-Martens Closed Tester) ..... 150° F. or legal
Maximum—(Pensky-Martens Closed Tester) .... 200° F.
(*b*) Water and Sediments, maximum..... 0.1%
(*c*) [2] Pour Point, maximum..... 0° F.
(*d*) Distillation Test:
When 10% has been collected in the receiver the thermometer reading shall not exceed..... 460° F.
When 90% has been collected in the receiver the thermometer reading shall not exceed..... 675° F.
(*e*) Viscosity, Saybolt Universal at 100° F. Maximum 55 sec.

Method of Testing[3]..3—The properties enumerated in these specifications shall be determined in accordance with the following methods of test of the American Society for Testing Materials, except as specified in paragraph (a).

(*a*) Flash Point:
[1] Minimum—The flash point, instrument and method for determining minimum flash point shall be that legal for the locality in which the oil is sold. In absence of legal requirements the minimum flash point shall be determined in accordance with the Standard Method of Test for Flash Point by means of the Pensky-Martens Closed Tester (Serial Designation D 93).
Maximum—Standard Method of Test for Flash Point by means of the Pensky-Martens Closed Tester (Serial Designation D 93).
(*b*) Water and Sediment: Standard Method of Test for Water and Sediment in Petroleum Products by Means of Centrifuge (Serial Designation D 96).
(*c*) Pour Point: Tentative Method of Test for Pour Points of Petroleum Products (Serial Designation D 97-27 T).
[2] The maximum pour point shall be 0° F. except for localities where the average temperature between October 1 and May 1 is 40° F. or above, in which case the pour point may be plus 15° F.
(*d*) Distillation Test: Tentative method of Testing Gas Oils (Serial Designation D 158-25 T).
(*e*) Viscosity: Standard Method of Test for Viscosity of Petroleum Products and Lubricants (Serial Designation D 88).

[3] In event changes are made in the Methods of Tests by the A.S.T.M. the current Methods of Testing is to be used rather than those mentioned in the specifications.

(*Continued on Data Sheet No. 48-L*)



American Society of Heating and Ventilating Engineers

Methods of Air Distribution

This paper, by L. L. Lewis, of the Carrier Engineering Corporation, was considered one of the outstanding contributions to the Semi-Annual Meeting of the A. S. H. & V. E. It is presented practically in full. High spots of other important papers, briefed in the last issue, also are presented.

IT is natural at the present time for any discussion of the subject of air-distribution methods to turn to the problems met in the designing of air-conditioning apparatus for theaters and auditoriums.

"It is best to begin with the admission that the air handled by the fans steadfastly refuses to recognize the authority of all of the *trained arrows* which are placed on the blueprints to show it where to go.

"Given a room, the four walls and ceiling of which are plain, unbroken surfaces, an evenly distributed heat loss or gain, and the freedom to run ducts without regard to appearances, the problem of *perfect* air distribution becomes a simple one. At the other extreme, such as is met in an elaborately decorated theater, the results obtained in many installations show that there is yet much to be learned. It is plainly the duty of the architect to reduce the wasted space behind furred walls and hung ceilings to the minimum and it is also plain that in many cases the limitations so imposed are beyond those with which the engineer now is prepared to contend.

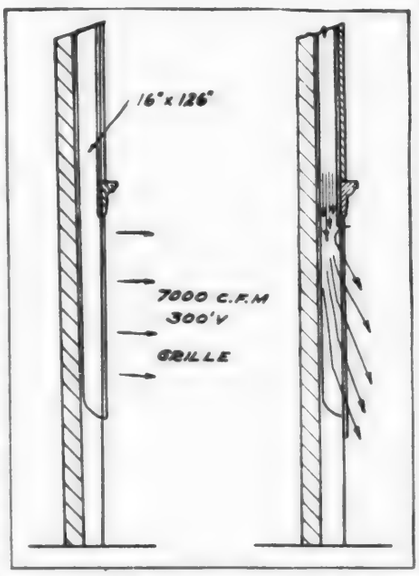
"In theaters there are two widely different types of distribution, the up-system and the downward-system.

"The up-system, in the practical application of which air is delivered at the floor line, was developed first. Coming from a plenum or ducts beneath the floor, the air is deflected horizontally by mushrooms or aisle hoods and occasionally by registers in rise of the steps forming the various levels in the balcony. Upon leaving the floor level, the flow is upward to exhaust or return openings, which are conveniently located overhead.

"Such a system is good for heating and may satisfactorily be used for ventilating with tempered air, but is unsatisfactory for cooling. The degree of this failure may be better understood when it is known that in the average theater, cooling is required in midwinter when about three-quarters of the seats are filled. Even when heating, the up-system fails to create circulation, that third important quality, and leaves the air dead in the theater.

"The difficulties in delivering cold air with this system are obvious. A certain amount of heat must be absorbed if satisfactory temperatures and humidities are to be maintained. If the cost of the system, the power and steam required for operation, and the space for apparatus and ducts are all unlimited, then, such air volumes may be delivered as to keep foot temperatures and head temperatures within suitable limits, but such is rarely, if ever, practicable. A full appreciation of the appeal of the picture and the attraction of the theater is possible, only to the close and interested observer, who spends enough time to note that not a few regular patrons come prepared with paper and what not with which to insulate their feet against the cold streams of air that hug the floor.

"The balcony slope adds certain complications. In a number of recent designs, the tendency of the lowest mushrooms to deliver the greatest volume has been overcome by an elaborate subdivision of the balcony plenum. This, however, still leaves a portion of the orchestra exposed to a spill of cold air, which cascades down the balcony slope because of its greater density.



Figs. 1 and 2. (Left) Outlet for Shallow Spaces with Air Flow Indicated; (right) How Air Actually Flows from Outlet

"The first attempts at cooling with refrigeration during the summer months were made by simply adding a direct expansion surface air cooler to an up-system. These were important steps in the development of theater cooling and a valuable contribution. Vastly improved summer conditions were obtained with installations that were considered successful, but which served more than anything else to prove that the up-system was not suitable for cooling.

"The public soon was to learn that comfort in summer as well as in winter could be provided upon demand. As a result, the up-system has generally been abandoned for all high grade cooling installations.

"While the downward system is by no means new, it is only during the last few years that the use of refrigeration for cooling has brought it forward for intensive study and development. This system first appeared as a sidewall outlet heating system. For the small, narrow movie theater this worked quite well and was considerably less expensive than the up-system, because the expensive plenum was not required even if space for it was available. Some ingenuity of design was required to heat successfully with downward circulation for it was necessary to exhaust the cold air from the floor level. It was discovered that an elaborate mushroom exhaust system was by no means necessary.

"As theaters grew larger and incidentally wider, the deficiencies of this system became apparent and now the reasons are obvious.

"Increasing the width of the theater increases the length of the blow from the supply outlets. The length of blow obtainable increases with the volume of air delivered from a single outlet, the velocity of delivery, the height of the outlet above the floor and to some slight degree, with the relative density of the air delivered. Whether the approach

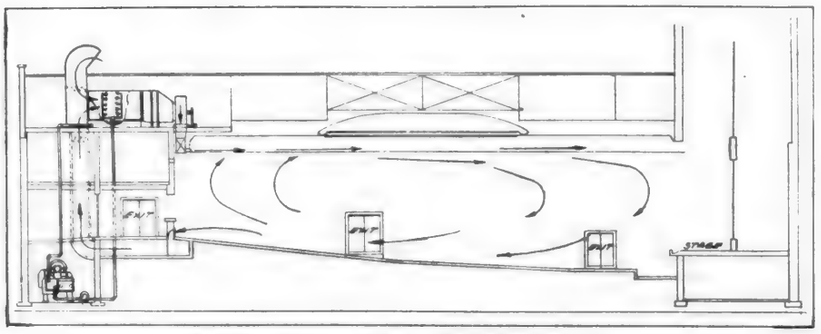


Fig. 3. System of Rear Wall Distribution

to the outlet is from above or below, the delivery must be sufficiently horizontal to avoid striking either the people or a deflecting obstruction on the ceiling. Depth of outlet is required to obtain this deflection and the engineer in this case must agree with the architect, that shallowness is essential, both for the conservation of sidewall space and for appearance.

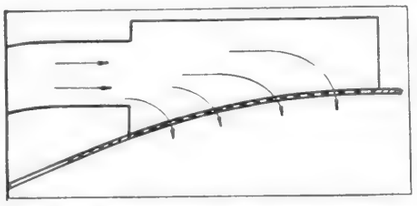


Fig. 4. Characteristic Use of Ceiling Grilles

"These two things therefore, are, in direct conflict and the result is an out let such as is shown in Fig. 1, which was selected from a set of plans just recently sent out for bids. The volume, 7000 cu. ft. of air per minute is ample for any flow that might be required. Note the four arrows. The engineer has passed his responsibility on to the contractor, and with these four arrows indicates that the flow through the grille is to be horizontal in direction and of uniform velocity from top to bottom.

"There are no conceivable baffles or guide vanes of sufficient depth to deflect the air horizontally from this outlet and at the same time, shallow enough to permit the down-coming air to pass to the lower part of the grille.

"What actually occurs is shown in Fig. 2. Note that a fifth arrow indicates that under the influence of the enlargement in cross section, a small volume of air is drawn into the outlet which later emerges and joins the downward flow toward the bald heads of the audience.

"Fortunately, there is a partial remedy. If the back of the grille is cut off so as to build up the outlet velocity and grille resistance, the direction of flow will approach the horizontal. But to obtain proper direction, the velocity through the openings must be several times the velocity of approach, which would result in a noisy outlet.

"It is interesting to note that at an outlet, room air is drawn into the stream and mixed with it, resulting in an induced secondary circulation and raising the temperature of the air stream by dilution. As the outlet velocity is raised, this effect increases in relation to the kinetic energy of the stream, and a whirl or circulation is created with a horizontal axis.

"The result, at velocities sufficient to blow half the width of the average 2000-seat theater, is apt to be a return current along the breathing zone back toward the outlet. While less sensitive than the back of the neck, the side face is sensitive to a degree that makes such circulation decidedly dangerous.

"Sidewall distribution, therefore, becomes increasingly difficult as the width of the theater increases and space at the sidewall is increasingly conserved.

"Relief from troublesome drafts is not to be had with low outlet velocities, but rather with velocities from outlets which will give control both of the direction and the intensity of the induced circulation. This has effectively been demonstrated in a rear wall distribution in which extraordinarily high velocities from outlets, unobstructed by grilles, carry cold air well over the heads of the audience to induce a return circulation in the opposite direction in the breathing zone. A vigorous circulation is possible with this method, because the return current flows uniformly into the faces of the audience.

"With this system contraction of the jet issuing from a converging nozzle draws large volumes of room air into the stream, thereby warming or cooling it by dilution. The high velocities induce a large secondary circulation. Note the arrows in Fig. 3.

"It is a difficult system to design as the size of the outlets and outlet velocity must be adjusted to the blow, which is quite sensitive to both. The subsequent interposition of a beam or an ornament by the architect or the failure of the engineer to discover such an obstruction is dangerous. Outlets that are too large or velocities that are too high are bad, but even worse is a low velocity which allows the air to spill before completing its intended travel.

"Unfortunately for the downward circulation, a great many large ceiling grilles have been used as outlets. The one shown in Fig. 4 is characteristic. The ceiling may be flat or slightly curved. The grille has a lattice or filagree pattern. Ordinarily, the clear area for air delivery varies from 40 to 60% of the gross area.

"The box may be a cone or a pyramid with air fed to it downward vertically from a drop pipe. Occasionally, something similar to the tuyère ring on a blast furnace feeds air, presumably from all directions. Outlet velocities are indicated by arrows and noted as ranging from 100 ft. per min. upwards.

"Regardless of what the outlet velocity may be, such a ceiling grille cannot be successfully used as an outlet of a cooling system unless some means of horizontal deflection is provided, or unless they are made small in size, large in number and uniformly distributed.

"In cooling a theater, it is necessary

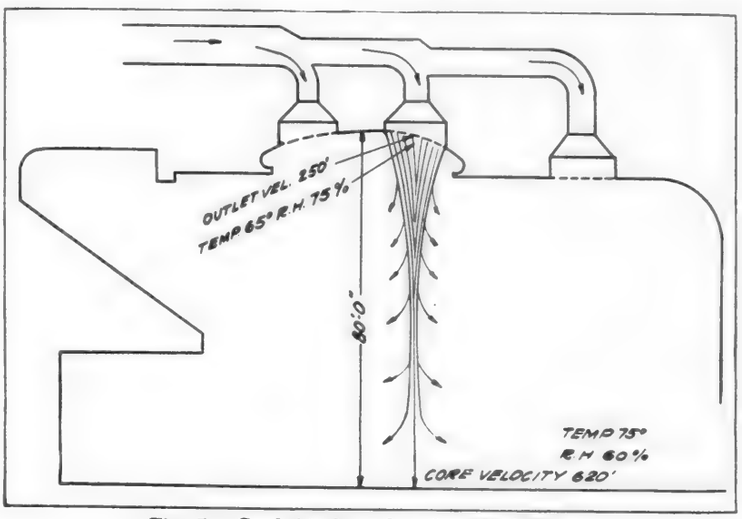


Fig. 5. Cool Air Introduced at High Points

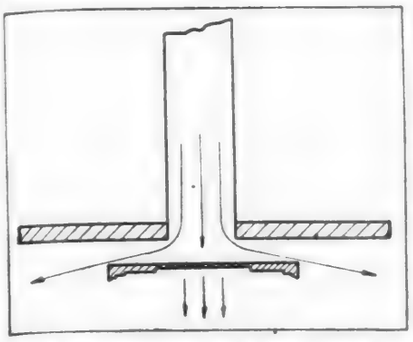


Fig. 6. Application of Pan Outlet for Cold Air Distribution

at times to deliver air at temperatures 10° below that in the theater. If 75° F. and 60% is to be maintained in the theater, air must be delivered at 65° F. and 75%. The weights per cubic foot are:

65° and 75% air	0.0744 lb.
75° and 60% air	0.0729 lb.
The difference is	0.0015 lb.

"Ceiling heights of 60 ft. are very common in theaters and, if a cubic foot of outlet air weighs 0.0015 lb. more than a cubic foot of room air, the difference in the weight of the two 60-ft. columns, 1 ft. square, is 0.09 lb. This difference is equivalent to a pressure of 0.018 in. water gage. The air velocity corresponding to a head of 0.018 in. of water is 540 ft. per min.

"Therefore, regardless of how low the velocity at this grille may be, the core of any air column not small enough to be completely dissipated before reaching the floor line will reach the floor line at a velocity of 540 ft. per min. The air flow will be something like the arrows in Fig. 5.

"If the ceiling is 80 ft. above the audience, our bald-headed friends will be struck with a column of cold air moving at a velocity of 620 ft. per min.

"Such velocities, of course, are fatal to the satisfactory operation of the system in any manner except as a heating system. Cold air may be blown straight downward, but only in such small volumes per outlet that the core will become completely diffused into room air before reaching the breathing zone.

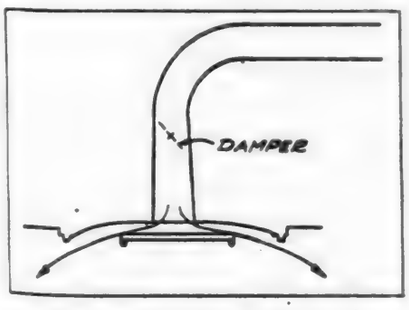


Fig. 7. Outlet for Horizontal Diffusion of Cool Air

"Circulation is highly desirable when it is under complete control and its temperature is first equalized with that of the room at all delivery temperatures. A movement of 150 ft. per min. in the breathing zone is permissible. There is no combination of temperature and humidity which can give satisfactory conditions unless accompanied by proper air motion to remove the body film and to give life to the air.

"The simplest application is shown in Fig. 6, in which the impact of the descending air current is taken by a screen of such restriction as to permit a part of the air to pass through and to deflect the other part horizontally. The screen may be omitted, but then the pan must be dropped farther below the ceiling. In a new theater a somewhat more artistic design as in Fig. 7 makes it possible to keep the pan closer to the ceiling line. It would be more accurate to call this a horizontal diffusion system for a good horizontal diffusion is essential to a successful application.

"My conclusions are:

"1. That the engineer should place less dependence on the arrows in front of the grille and more upon his details of the necessary deflection vane behind it.

"2. The engineer should educate the architect to a more complete understanding of the danger of placing deflecting surfaces or obstructions in the path of the air leaving the outlets.

"3. That much is yet to be learned about air distribution through research and experiment as a very large part of our present knowledge is in the form of personal opinion."

Development of Gas Heating for Homes

By W. E. Stark

"The impression must not be held that gas as a fuel for heating is suitable only for residence use. In larger applications it may have a real economic superiority over other fuels. The following are some of the elements entering into the operating costs of heating plants:

a. Interest on the investment for apparatus.
b. Depreciation on the apparatus.
c. Maintenance of the apparatus.
d. Rental value of the floor space for the apparatus and for fuel storage.
e. Attendance, including firing and superintendence.
f. Damage to premises and to work done therein due to dirt from heating.
g. Fuel cost.

In making the following comparison it is assumed that the fuel used has no effect on the cost of the heating plant other than that of the boilers themselves and also assumed that the boilers take up equal space for either fuel.

"Gas is not inherently an efficient fuel when compared with other fuels. Due to its large hydrogen content, which appears both in the free and in the combined states, water vapor is one of the products of combustion. When 1 cu. ft. of the average manufactured gas is burned a little over 1 cu. ft. of water vapor is formed, and when 1 cu. ft. of natural gas is burned a little over 2 cu. ft. of water vapor are formed. The heat content of this water vapor represents about 10% of the total heat value of the gas. This heat cannot be reclaimed unless the products of combustion are cooled down to their dew point which usually is in the vicinity of 130°. Since in a steam boiler the temperature of the escaping products of combustion must necessarily be above that of the steam delivered, it is impossible to cool the escaping flue gases to their dew point. Therefore 10% of the heat in the fuel goes out unused in the water vapor. 5% is about the minimum amount that can be charged against dry stack loss. The maximum efficiency of a gas-burning steam boiler, with no allowances for radiation from the jacket therefore is 85%

Item	*Gas*	*Coal*
Equivalent direct radiation (sq. ft.)	8500	8500
Cost of boilers (two units installed)	$4550.00	$3830.00
(a) Interest on the investment	$ 273.00	$ 229.80
(b) Depreciation reserve (20 years)	123.67	104.10
(c) Maintenance	50.00	250.00
(d) Rental value for fuel storage: 600 sq. ft. at 40c		240
(e) Attendance: 2 firemen 35 weeks at $42 per week		2940.00
Superintendence	875.00	875.00
(f) *Damage to premises and to work		
(g) Fuel cost: 52.5 lbs. coal per sq. ft. per year at $7.50 per ton		1672.50
900 cu. ft. of gas per sq. ft. per year at 75 cents per 1000 cu. ft.	5737.50	
Annual operating cost	$7059.17	$6311.40

*Item f in the tabulation of elements given, of course, cannot be evaluated and might or might not be of vital importance.

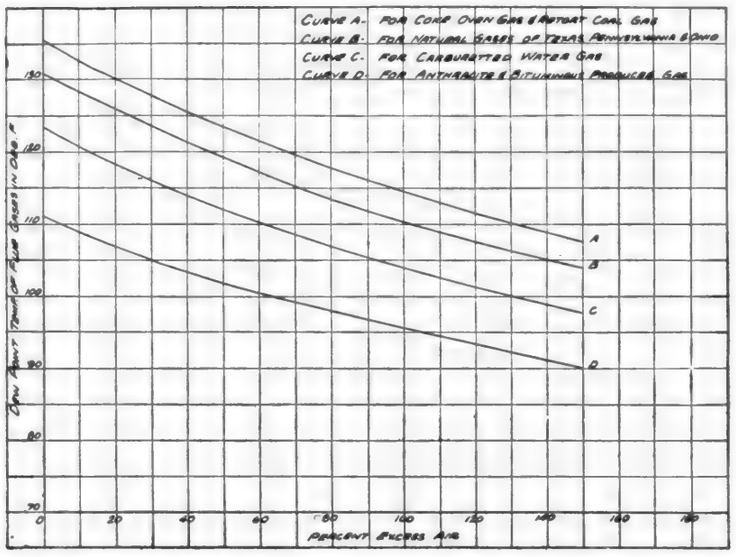

CURVE A- FOR COKE OVEN GAS & RETORT COAL GAS
CURVE B- FOR NATURAL GASES OF TEXAS, PENNSYLVANIA & OHIO
CURVE C- FOR CARBURETTED WATER GAS
CURVE D- FOR ANTHRACITE & BITUMINOUS PRODUCER GAS
A
B
C
D
PERCENT EXCESS AIR

Fig. 1. Relation Between Dew Point of Flue Gases and Per Cent Excess Air (Air for Combustion Considered Perfectly Dry)

or less. Radiation losses will bring the efficiency closer to 80% than to 85%.

"Contrary to the situation that exists with respect to coal-burning boilers, there is a very general agreement as to how gas boilers shall be tested and rated. Economic considerations dictate the goal for which designers shall strive. Boiler efficiency must be as high as is compatible with the necessity of having stack temperatures high enough to provide adequate draft. Excess air must be as low as is compatible with complete combustion and therefore safety. There is no uncertainty about the numerical value of these limits. Testing and rating, therefore, become a matter of determining how much fuel can be burned completely under a given boiler and how much heat is delivered at the boiler outlets when operating at the combustion rate that has been fixed as the allowable maximum. The draft condition imposed by the American Gas Association for approval tests conducted in its laboratory is very simple. It is merely a condition of zero draft. The criterion of the maximum allowable fuel consumption is the CO content of the flue gases. The maximum permissible is 0.04% reduced to an air-free basis.

"A boiler given a rating on the basis of such a laboratory test will neither fail to make, nor exceed that rating, by more than 5% when it is finally installed and fired at the rate determined upon as permissible. Therefore, in boiler selection the only uncertain factors are found in the heating system; in the correctness of the radiation and in the starting and piping allowances. The boiler capacity is an accurately determined quantity.

"Dr. Steinmetz predicted that coal some day would be gasified at the mines and distributed through pipes instead of on wheels. Gasification results in a fuel or fuels (gas and coke) that has a form value superior to that of the coal from whence it was derived and in addition leaves many valuable by-products, such as tar, pitch and oils. Constant research in the treatment of coal is revealing the possibilities of various processes of low temperature carbonization and complete gasification.

Method of Calculating Cost of Gas Heating

By A. E. Stacey, Jr., and W. B. Thornton

"Fig. 1 gives curves for the different types of gases, showing the relationship between the percentage of excess air and the dew-point temperature of the flue gases. For example, Curve A is for coke oven gas or retort coal gas. With 100% excess air, the dew-point of the flue gases would be 110½° F. This is correct within 3 or 4%. Figs. 2 and 3 give the relationship between the flue gas dry-bulb temperature and the amount of heat lost in the effluent gases with different percentages of excess air. For example, if there is 30% excess air and a dry-bulb temperature of 350° F. in the flue gases, there would be a loss of 17%. It is interesting to note the effect of excess air on the efficiency of the equipment. For example, if instead of 30% excess air, there was only 15%, with the same temperature of flue gases, the loss up the stack would be 16.3%, or a decrease of 0.7%. If, however, the excess air increased to 60%, the losses would be 18.5%. The effect of the flue temperature on the losses is also of great importance. By referring again to Fig. 2, it is shown that by an increase of 50° F. in the flue temperature, there is 1.2% increase in loss up the stack and by lowering the flue temperature 50° F., there is an increase in efficiency of 1.2%.

"By the use of the two curves, the stack loss is easily determined. While the flue loss, no doubt, is in most cases of the greatest importance, there is loss by radiation in connection with every gas-burning appliance. In different types of appliances, this varies from 3% to 10%. In obtaining the overall efficiencies, the radiation loss must be added to the flue losses. In a great many cases, the heat given off by the appliance through radiation is not lost, as it assists in heating up the basement or the room where the appliance is located. Efficiencies of different types of gas-burning equipment, as found in practice, are shown in Table 1."

With the chart developed by the authors, the procedure in determining gas consumption for any given installation in a certain locality would be as follows:

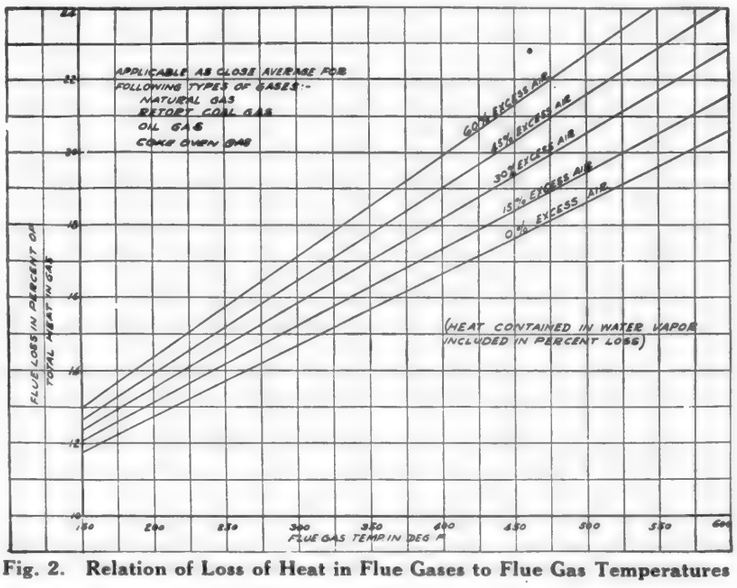

APPLICABLE AS CLOSE AVERAGE FOR FOLLOWING TYPES OF GASES:-
NATURAL GAS
RETORT COAL GAS
OIL GAS
COKE OVEN GAS
60% EXCESS AIR
45% EXCESS AIR
30% EXCESS AIR
15% EXCESS AIR
0% EXCESS AIR
(HEAT CONTAINED IN WATER VAPOR INCLUDED IN PERCENT LOSS)
FLUE LOSS IN PERCENT OF TOTAL HEAT IN GAS
FLUE GAS TEMP IN DEG F

Fig. 2. Relation of Loss of Heat in Flue Gases to Flue Gas Temperatures

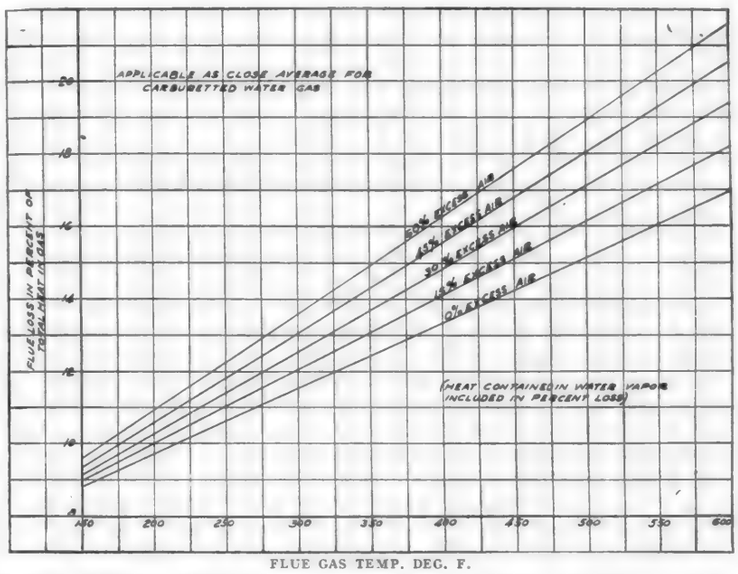

APPLICABLE AS CLOSE AVERAGE FOR CARBURETTED WATER GAS
50% EXCESS AIR
45% EXCESS AIR
30% EXCESS AIR
15% EXCESS AIR
0% EXCESS AIR
(HEAT CONTAINED IN WATER VAPOR INCLUDED IN PERCENT LOSS)
FLUE LOSS IN PERCENT OF TOTAL HEAT IN GAS
FLUE GAS TEMP. DEG. F.

Fig. 3. Relation of Loss of Heat in Flue Gases to Flue Gas Temperatures

"By referring to Fig. 4, which gives the relationship between the degree days and the gas consumption in thousands of cubic feet per year for different types of gases, it is possible to estimate easily the yearly consumption of gas for different installations. This relationship is similar to that shown in the 1928 A.S.H. & V.E. *Guide*, on pages 238 and 239, with the exception that that chart is based on one efficiency only for the gas-burning equipment. With the chart now presented, based on 100% efficiency, the result must be divided by the efficiency of the apparatus which is being used.

"The ranges of efficiencies for different types of equipment are given in Table 1 and by the use of the dew-point method of determining excess air and stack losses, the efficiency of the apparatus in question is easily determined as shown. This chart gives the yearly consumption in thousands of cubic feet of gas based on B.T.U. estimates, using the standard A.S.H. & V.E. method of determining heat losses from buildings. In case these losses have been determined directly in square feet of steam radiation or square feet of hot water radiation, the simple formula given can be used to determine the yearly gas consumption.

"For example, New York has 5300 degree days and the gas that is burned in New York has a heating quality of 530 B.T.U. per cu. ft. The value of Q would then be 34.5. By referring to formula (A) for steam radiation, $G = \frac{.024RQ}{E}$ and solving with the value of R equal to 1 sq. ft. of radiation, the consumption of gas per square foot of steam radiation if E = 85% is 0.974. If a hot-water system is being considered, equation (B) would be used and (Q) would be obtained in the same manner.

TABLE 1. USUAL EFFICIENCY RANGES* FOR GAS-BURNING HEATING APPLIANCES

Type of Appliance	Heat Transfer Efficiency	Gross Efficiency
Low-pressure steam boilers	80% to 85%	70% to 82%
High-pressure steam boilers	78% to 83%	68% to 80%
Hot-water boilers	80% to 85%	70% to 82%
Natural draft furnaces	75% to 85%	65% to 80%
Forced draft furnaces	80% to 91%	72% to 89%

*Table applies to appliances especially designed for burning gas. It cannot be used for average results in conversion jobs.

$$\text{Heat Transfer Efficiency} = \frac{\text{Gross Heat Input—Flue Loss}}{\text{Gross Heat Input.}}$$

$$\text{Gross Efficiency} = \frac{\text{Gross Heat Input—Flue Loss—Boiler Radiation Loss}}{\text{Gross Heat Input.}}$$

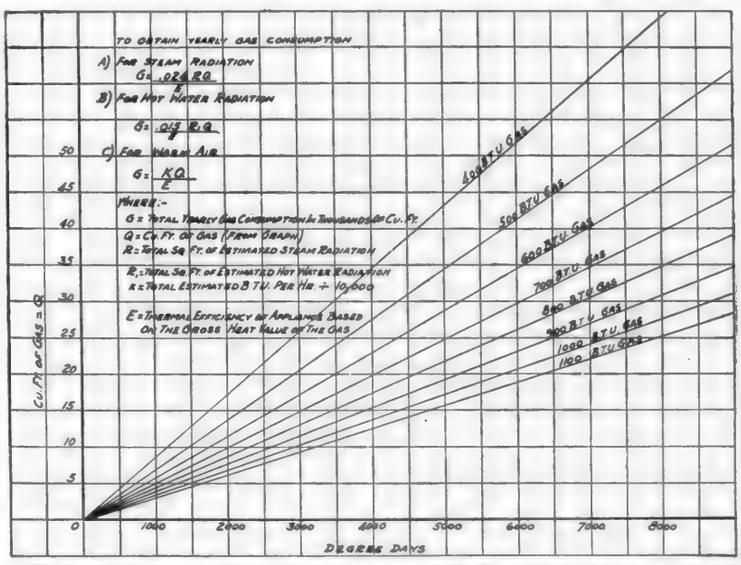

TO OBTAIN YEARLY GAS CONSUMPTION
A) FOR STEAM RADIATION G = .024 RQ / E
B) FOR HOT WATER RADIATION G = .015 R₂Q / E
C) FOR WARM AIR G = KQ / E
WHERE:-
G = TOTAL YEARLY GAS CONSUMPTION IN THOUSANDS OF CU. FT.
Q = CU. FT. OF GAS (FROM GRAPH)
R = TOTAL SQ. FT. OF ESTIMATED STEAM RADIATION
R₂ = TOTAL SQ. FT. OF ESTIMATED HOT WATER RADIATION
K = TOTAL ESTIMATED B.T.U. PER HR. ÷ 10,600
E = THERMAL EFFICIENCY OF APPLIANCE BASED ON THE GROSS HEAT VALUE OF THE GAS
400 B.T.U. GAS
500 B.T.U. GAS
600 B.T.U. GAS
700 B.T.U. GAS
800 B.T.U. GAS
900 B.T.U. GAS
1000 B.T.U. GAS
1100 B.T.U. GAS
CU. FT. OF GAS = G
DEGREE DAYS

Fig. 4. Relation of Heat Requirements and Yearly Gas Consumption

Operating Data on Federal Buildings

By Nelson Thompson

From this paper the following more or less connected data are taken:

"An analysis of all the federal buildings for which steam is purchased shows that north of Richmond, Va., approximately 5 lb. of steam is used per cubic foot per season for heating the buildings. This, of course, varies widely, due to local conditions, winds, building construction, manner of operation, etc. In fact, in the north in the same state variations run from 3 lb. of steam per cubic foot for one building to 7 lb. for another building.

"Some 6000 engineers, janitors, laborers, firemen, charwomen, mechanics, etc., are employed to care for these buildings, and the cost for the last fiscal year was $6,500,000. There is approximately one employee of this character for each 100,000 cu. ft. of building content.

"A laborer is expected to keep clean, on an average, 6000 to 8000 sq. ft. of floor area, while a charwoman (working 5 hrs. per day) is expected to keep clean 3000 sq. ft.

"The average cost for fuel and labor to heat the buildings, using bituminous coal at approximately $5.30 per ton is ¼ cent per cubic foot per annum.

DETERMINATION OF RELATIVE COST OF HEATING WITH PURCHASED STEAM OR WATER

"In order to compare the prices quoted

by a public service corporation for steam or water for heating with the cost of generating the same in the boilers provided, it is the practice, north of Richmond, Va., to multiply the square feet of the direct steam heating surface by 500 to ascertain the number of pounds of steam condensed per annum in the system, and divide the result by 7 to ascertain the number of pounds of coal required in the low-pressure heating boilers.

"This information, together with the local price of coal delivered in the bunkers, cost of labor for firing, if any, and the rates for steam, quoted by the local district heating company, furnish all facts in the case. If oil or gas is used as fuel in lieu of coal, these are reduced to the equivalent coal basis by assuming that 4 barrels of fuel oil or 25,000 cu. ft. of natural gas equal one net ton (2000 lb.) of first-class bituminuous run-of-mine coal.

"The total cubic contents of the building multiplied by 5 are assumed to equal the total pounds of steam per annum for heating and ventilating.

"The average demand for steam per hour for heating and ventilating equals the annual consumption divided by 5000 (the number of hours in the average heating season).

"Maximum demand for steam per hour for heating and ventilating is 2½ times the average demand. This maximum demand figure divided by 30 gives the maximum boiler horsepower.

"If the heating surface is known, the fan blast coils are reduced to the equivalent of direct radiation by multiplying the square feet of heating surface in the fan blast coils by 3; and after all surface is reduced to equivalent direct steam radiation, to ascertain the total steam required per annum, the number of square feet of equivalent direct steam radiation is multiplied by 500. This is used as a check on the first assumption, and the mean of the two quantities usually is taken.

"Steam per annum used for heating water for sanitary purposes is 10% of the total steam used for heating the building.

"Roughly, 6/10 lb. of coal per cubic foot is required for heating the ordinary building, while in buildings containing electric generating plants 1 lb. of coal per cubic foot is approximately correct for all purposes.

"For boiler room repairs allow $2 per annum per H.P. nominal rating.

"For boiler and engine room supplies, allow $1 per annum per H.P. of boilers installed.

"Boiler room labor averages $2 per ton of coal fired, based on an 8-hr. shift and 48 hrs. per week.

"Generally the Public Utility Company is expected to make a figure that will result in an annual saving of at least 10% over what it costs the government to provide itself with steam and electricity."

As a conclusion to his paper, Mr. Thompson worked out in detail the application of his general data to several buildings, including the District Building, Washington, and the Post Office, Washington, the computation showing that the approximations presented in this paper are reasonably correct.

Coefficients of Heat Transfer as Measured Under Natural Weather Conditions *

F. C. Houghten and C. G. F. Zobel

"In making this investigation, it was hoped that certain conclusions could be drawn regarding:

"1. Various coefficients entering into heat-loss computations for the different types of construction.

"2. The accuracy of heat transmission coefficients now in use for certain types of walls which were derived from calculations based upon meager facts and questionable assumptions.

"3. The applications of generally accepted coefficients to walls in buildings subjected to natural changing temperatures, and other climatic conditions.

"4. The characteristics of heat flow in its relation to changing weather conditions, maximum and minimum temperature differences and other factors.

"5. The practicability of the heat-meter method of determining conductivity, conductance and inside and outside surface conductance coefficients.

"In order to see whether the individual readings throughout a test showed any relation to the mean temperature of the wall, the bi-hourly conductance coefficients corrected for storage of heat in the wall, due to change in temperature, were plotted against mean temperature of the wall. Again there is considerable variation in the individual values. There is, however, an apparent tendency toward a curve sloping downward to the left. The curve indicates an increase in the conductance coefficient of 1/100 B.T.U./per square foot/per hour/per degree temperature difference for a mean temperature rise of 7.0° F.

"In determining heat loss from buildings under winter conditions the temperature of the wall cannot be controlled, and the results given in this paper are for the particular mean wall temperatures which happen to obtain at the time.

"In determining heat transfer coefficients with the heat meter where the rate of flow and mean temperature of the wall depends upon natural weather conditions, results must be corrected for change in temperature of the wall unless data are collected over a period long enough to eliminate the effect of this error. As a rule it is possible in a test extending over three or four days to pick such a period that the mean temperature of the wall at the beginning and end are the same.

*Copyright, 1928, by The American Society of Heating and Ventilating Engineers.

DATA ON WIND COLLECTED

"Throughout the investigation at the Laboratory, observations on wind as given by the Weather Bureau and also as determined at various points near the wall tested have been recorded, with the hope that the various factors involved could be evaluated. So far, little or no direct correlation has been found. However, a more complete analysis will be made of the data already in hand, together with additional data to be collected with a view of solving the problem. It is hoped that it may be possible to differentiate between the different variables and arrive at a practical method of determining outside surface coefficients with the meter under actual conditions."

Massachusetts Chapter

Recently elected to serve as officers of the Massachusetts Chapter for the coming year are: President, E. C. Whitaker; treasurer, W. T. Smallman; secretary, J. W. Brinton. Board of governors: E. C. Whitaker, Coll T. Flint, G. H. Gleason, Philip Drinker, T. F. McCoy, J. W. Brinton. Ex-officio, D. S. Boyden, succeeding E. A. Dusossoit, whose term expires.

Pacific Northwest Chapter

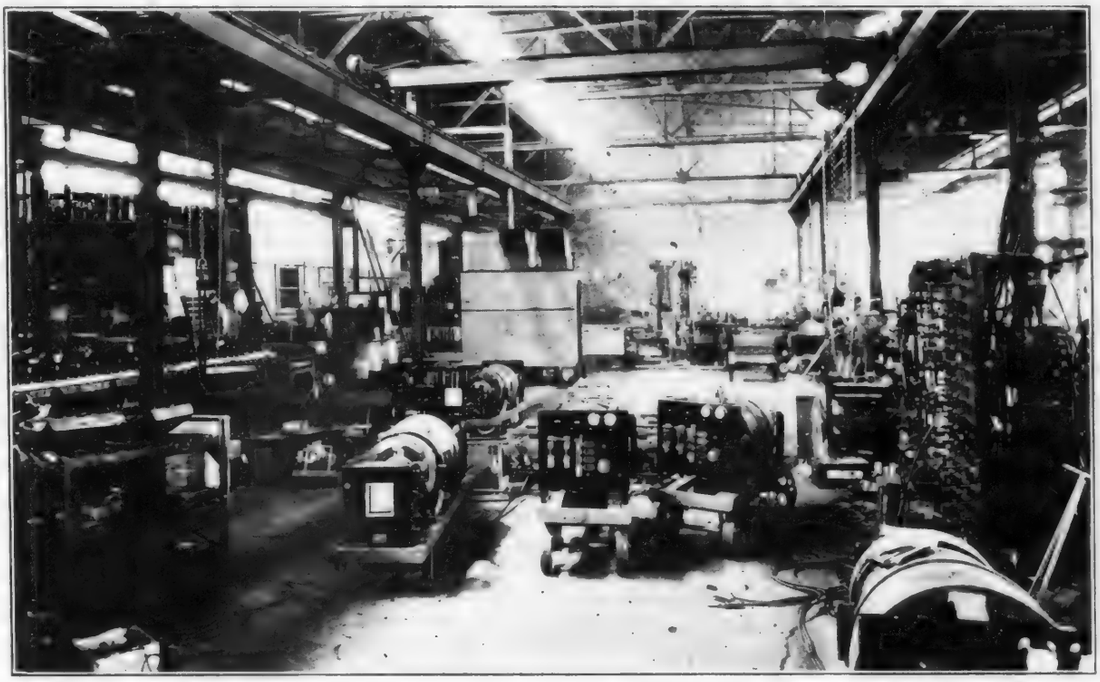
The following new officers were elected at a recent meeting of the Pacific Northwest Chapter: President, W. L. Dudley; vice-president, E. L. Weber; secretary, E. O. Eastwood; treasurer, C. F. Twist. Board of governors: W. E. Beggs, W. W. Cox and M. Mallis.

Michigan Chapter

At a recent meeting of the Michigan Chapter, which was held at the Hawthorne Valley Golf Club, Detroit, the following officers were elected: President, W. A. Rowe; vice-president, William G. Boales; treasurer, R. K. Milward; secretary, E. H. Clark. Board of governors: W. J. Whalen, E. E. Dubry and J. F. Fuller.

Unit Heaters Show Economy in Large One-Story Factory

Substituted for Direct Radiation, They Produce Uniform Heat Over Large Area. Details of Installation and Operation



Unit Heater in Lincoln Electric Company's Plant Showing Characteristic Type and Placement of Machinery

INSTALLATION of six unit heaters has solved a difficult heating problem in the main factory of the Lincoln Electric Company, Cleveland, O., and, at the same time, has brought about a substantial reduction in heating costs. This equipment, installed at a cost of $9,500 is doing effectively what otherwise would have required over 27,000 sq. ft. of direct pipe-coil radiation. Savings effected in fixed charges, coal and boiler-room labor total about $2,600 per year and the units are credited with earning a net annual return of 27.5% on their total first cost.

PLANT LAYOUT

The Lincoln Electric Company occupies three buildings with a total floor area of 166,800 sq. ft. The building with which this survey is concerned is of typical one-story factory construction, 180 ft. by 500 ft., with 60-ft. side bays, 14 ft. 6 in. high to the lowest member of the roof trusses and a center 60-ft. bay 29 ft. 6 in. from floor to truss. Roofs are of monitor type, covered with red tile, and the vertical sections contain 13,000 sq. ft. of glass mounted in standard metal sash. Side walls have a 9 in. course of brick at top and bottom and contain 8,760 sq. ft. of glass.

ORIGINAL HEATING SYSTEM

The one-story building is entirely exposed on the 500-ft. north and south sides, and the construction is of a type notoriously difficult to heat properly at reasonable cost and trouble was experienced during the first winter of occupancy.

Radiation in this building was entirely of the pipe-coil type, 12,600 lin. ft. of 2-in. pipe along the walls under the windows and 19,000 ft. suspended as a horizontal grid 15 ft. above the floor. The total radiation was about 19,600 sq. ft.

The first remedial measure attempted was to change the system over from pressure to vacuum type. This met with relatively little success and the improvement was slight. Two boilers of 150-H.P. rating were driven to their maximum hand-fired capacity on cold days to carry the 19,600 sq. ft. of radiation in the one-story building, plus 8500 sq. ft. of pipe and sectional radiation in the two other buildings.

It frequently was impossible to heat the one-story unit above 40° F. (at working level) in cold weather, and the distribution was far from uniform. The boilers were operated at full capacity 24 hrs. a day at some periods. It was necessary, during practically the entire winter season, to apply full steam pressure, starting at midnight in order to have the temperature of the one-story unit above 40° F. by 7:00 A.M.

Fuel consumption during the calendar year preceding this study (1926) was 1250 tons, and the cost, at an average of $4.10 a ton delivered, was $5125.

INSTALLATION OF UNIT HEATER EQUIPMENT

The evident impracticability of expanding the existing direct-radiation system caused an investigation to be made of the possibilities of using floor-mounted unit heaters in the main shop

Taken from a report made by A. C. Nielsen Company, Engineers.

building, and the installation was made early in 1927.

A total of six units are now in use in the main shop. Three are driven by 5-H.P. motors; two by 3-H.P. motors; the sixth by a 5-H.P. motor. All are equipped to use boiler steam at 50-lb. pressure and a special pipe line was run from the boiler room for the six heaters. All heaters are equipped with thermostatic controls, connected into the motor circuits, and the system is largely automatic in operation.

RESULTS OBTAINED

A short try-out of the unit heaters was ample to convince the management that the old system would no longer be wanted; it was shut off permanently and soon will be removed from the building.

A temperature of from 55° to 60° F. was determined as most desirable for comfort and efficiency of those employed in this shop. Thermostats were set accordingly and the building was kept at a comfortable temperature without difficulty throughout the entire season and with relatively little variation over the entire area of nearly 90,000 sq. ft.

The six units operated continuously only on the coldest days and not more than three units were needed at any time to keep the plant above freezing temperature at night. The following tabulation shows the approximate operating schedule for varying weather conditions:

Outdoor Temp. Range Deg. F.	Time	No. Units On	Actual Running Time Percent
32	*Day	All (6)	75—100
	*Night	1 to 3	100
32—40	Day	All	50
	Night	1	50
40—50	Day	All	25
	Night	None	0
50—60	Day	All	10
	Night	None	0

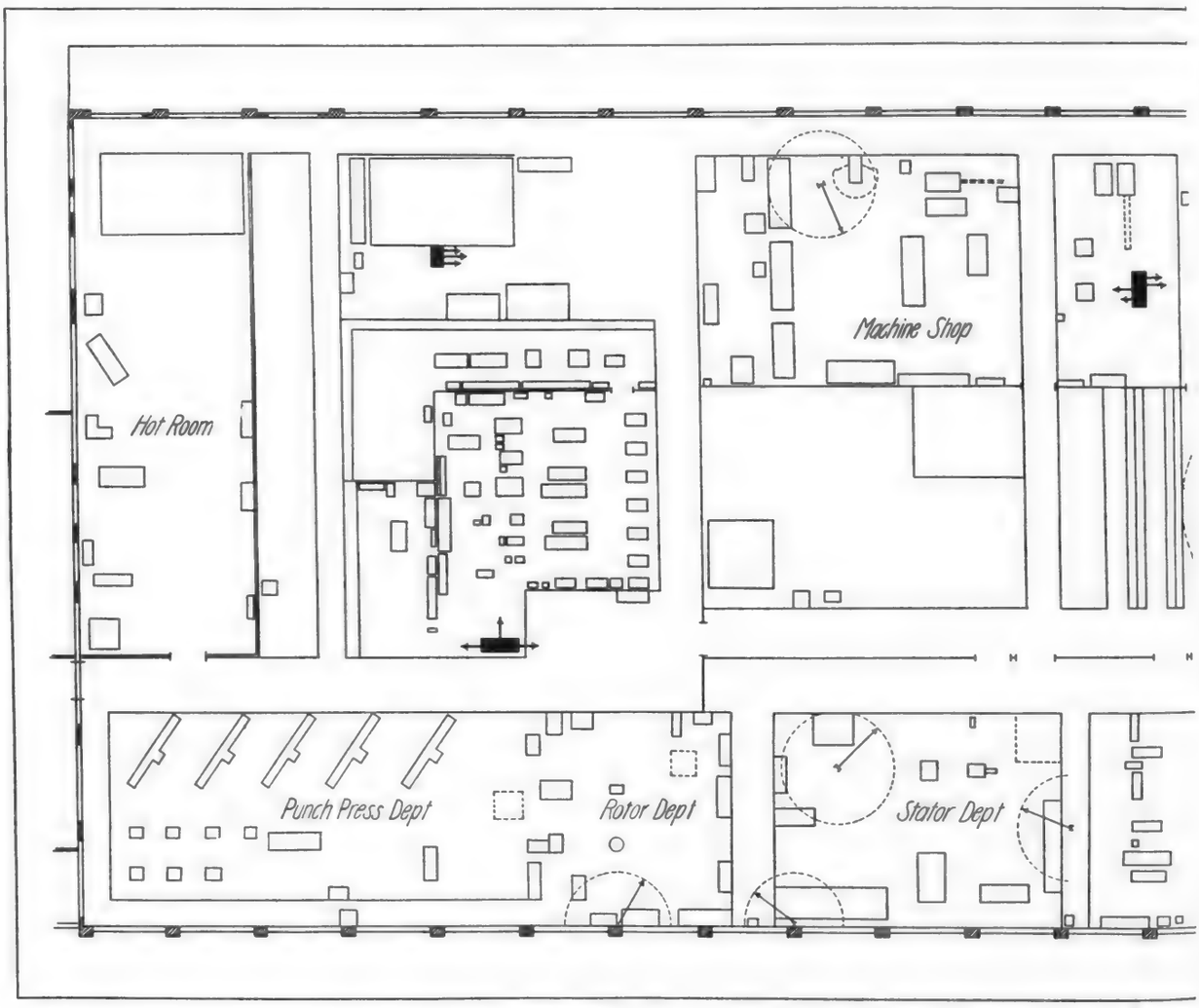
The heating-up of the building now is a relatively simple matter. The fireman turns off from 3 to 6 units when the shop is shut down at 4:30 P.M. and starts them again in the morning at whatever time he thinks proper, according to prevailing weather conditions. On the coldest days the starting time is about 6:00 A.M. and the building is regularly up to working temperature when the force comes on at seven o'clock. Six-thirty is the usual starting time in ordinary weather.

*Day run 6:30 A.M. to 4:30 P.M.; Night 4:30 P.M. to 6:30 A.M.

HEATING COSTS WITH UNIT SYSTEM

Fuel consumption during the calendar year of 1927 totalled 850 tons. The coal was of the same kind used in 1926 and no change had been made in the system other than the installation of the unit heaters. The heating requirements were less severe, however. The records of the U. S. Weather Bureau for Cleveland show 5,422 degree-days below 60° F. in 1926 and only 4,663 degree-days below 60° F. in 1927.

The year 1927 therefore was somewhat easier from the standpoint of heating load and the recorded fuel consumption for this year must be corrected by the factor 5,422/4,663 for purposes of comparison with the recorded fuel consump-



Layout of One Building of Lincoln Electric Company's Plant Showing

tion of the preceding year when direct radiation was in use. The application of this factor gives a figure of 989 tons as the probable fuel consumption, with the unit heaters in use, had weather conditions in 1927 been the same as those of 1926.

The total installed cost of the six unit heaters, complete with motors, controls and steam piping, was $9,479. A 15-year life has been assumed as a basis for fixed-cost calculations, and suitable allowances made for repairs and maintenance. Power cost is figured at $.015 per kw.-hr., on the basis of motor sizes, load factors and observed operating time. The total power cost closely approximates $325 per year.

With the above figures, and not considering boiler fixed-charges or boiler-room labor, a calculation now can be made of heating cost.

Fuel:
989 tons at $4.10 per ton....$4,054.90
Equipment costs:
Depreciation—
$9,479 15-yr. life....$631.93
Average interest at 6%—
16/15 x $9,479 x .06/2 303.33
Maintenance and repair—
General allowance .. 90.00
Lubrication—
Grease and labor.... 5.40
Power 325.00
Total 1,355.66
Total, fuel and equipment..$5,410.56

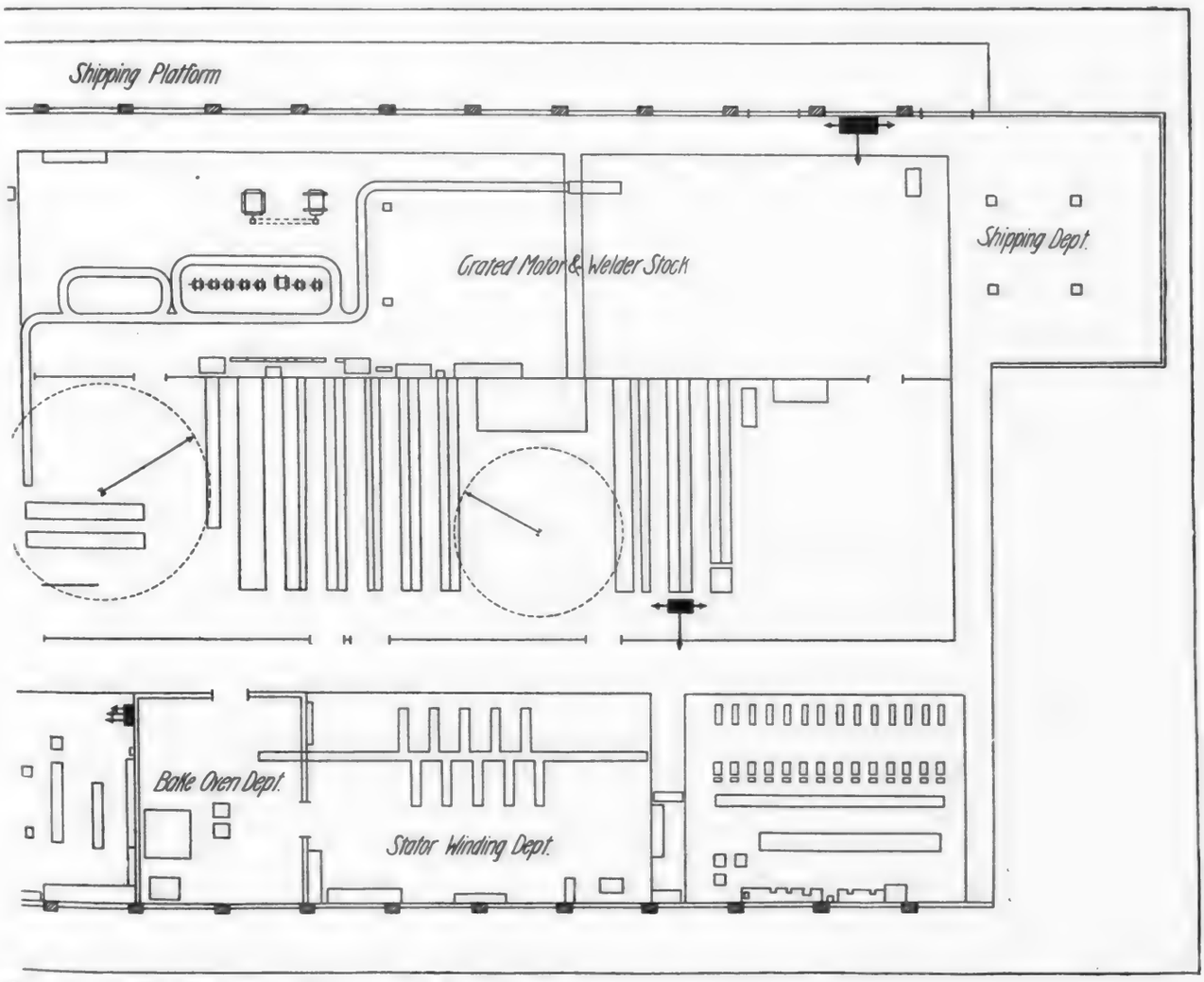
These figures compare as follows with the probable cost of satisfactorily heating the building with direct radiation, based on an addition of 40% more direct radiation and a 20% additional fuel consumption.

Fuel:
1,250 tons at $4.10 per ton, plus 20% $6,150.00
Additional fixed charges:
Depreciation on added investment—
$7,500—20-year life..$375.00
Average interest at 6%—
21/20 x $7,500 x .06/2 236.25
Additional maintenance cost—
Allowance 60.00
Total 671.25
Additional Labor:
1 fireman at $5.00 per day, 180 days 900.00
Total above $7,721.25

SAVINGS EFFECTED

The economic soundness of the investment in unit heaters is clearly evident from a comparison of the totals shown in the preceding cost tabulations.
Total for 1926.....$7,721.25
Total for 1927..... 5,410.56
Net saving $2,310.69

It will be noted that the above net saving is predicated on an equality of other costs not within the scope of this study and also on the assumption that satisfactory heating could have been had if the engineers' recommendations had been followed in adding to the original direct radiation system.



Disposition of Unit Heaters and Direction of Their Output

Present Practice in Vapor Heating

Previous articles in this series are:

1. *Webster Type R Modulation System, August*, 1926.
2. *Dunham Home Heating System, August*, 1926.
3. *The Illinois System, September*, 1926.
4. *Hoffman Controlled Heat, September*, 1926.
5. *The Mouat System, October*, 1926.
6. *The Trane System, November*, 1926.
7. *The Sarco System, December*, 1926.
8. *The O-E Perfect 3-in-1 System, January*, 1927.
9. *The Gorton System, February*, 1927.
10. *The Barclay System, May*, 1927.
11. *The Richardson System, June*, 1927.
12. *The Barnes & Jones System, July*, 1927.
13. *The Broomell System, November*, 1927.
14. *The Hutchison System, May*, 1928.

15. The Veco System

THE Veco vapor system is of the "open-to-atmosphere" type, depending for the circulation of vapor on the suction in the return piping, obtained by an air pipe carried from the air-separating chamber on the back of the Veco governor into the boiler flue. This suction is constant and is sufficient for complete circulation of vapor, even in extremely large buildings.

From the bottom of the body of the Veco governor, which is set in a vertical position beside the boiler, a 2-in. pipe is carried down and connected to the return header of the boiler, without valves of any kind. This establishes a water line in the governor, level with the water line in the boiler, at which floats a large copper ball, the only moving part of the governor. Fluctuations of the water line in the boiler, when in operation, due to pressure, raise or lower the water in the governor and move the float, which thus acts as a boiler-pressure regulator, by means of chains running from the float over pulleys to the draft and check doors of the boiler.

Where gas is used as fuel, the float regulates a lever-type valve on the gas-supply pipe, and where oil is used as fuel, the float usually is connected to an electric switch.

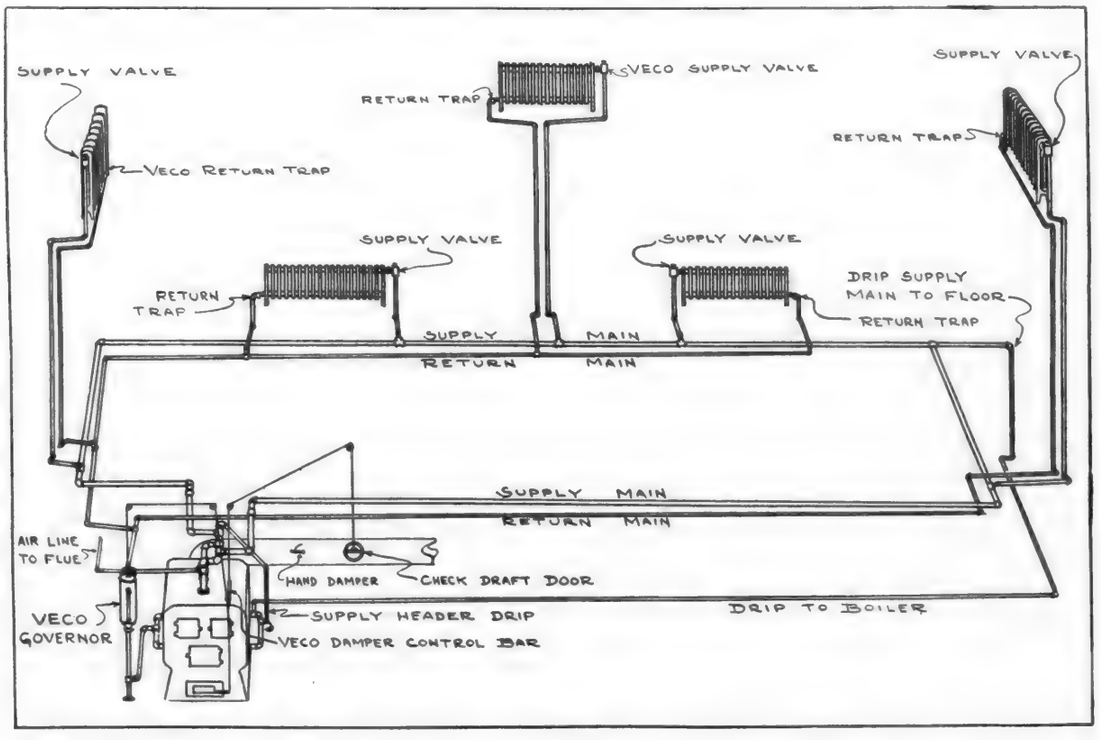
No check valves are used on the boiler returns, as the intention of the system is to avoid any mechanical or moving apparatus which would require attention or repairs.

HOW THE FUNCTIONING IS CONTROLLED

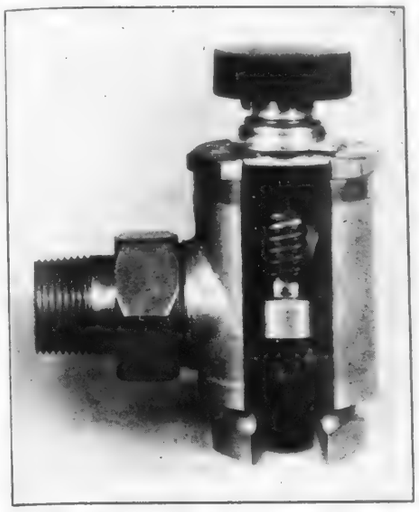
The governor, in addition to the air-separating chamber, is provided with an equalizing chamber containing a brass tube immersed in water and open at the bottom. From the top of this tube, which is provided with a brass bushing, a live-steam connection is taken to the boiler flow pipe. When pressure is generated in the boiler the pressure displaces the water in this brass tube until a limit of 9 oz. pressure is reached, at which pressure steam reaches the bottom of the tube and flows out the water seal, relieving the boiler pressure before water can be forced over the top of the governor.

Veco specialties include an auxiliary relief valve, of the weighted type, without springs, which blows at 8 oz. pressure and is set directly on the boiler. Both the chambers in the governor—the air-separating chamber and the equalizing chamber—are joined at the bottom, so that, after the governor blows, the water seal in the chambers is re-formed by return water from the radiators.

There are seven sizes of the Veco supply valve, six having a ¾-in. and one having a 1-in. tapping. These valves are designed to fit radiators of various sizes.



General Arrangement of Veco Specialties Applied to "Open-to-Atmosphere" Vapor Heating Systems



Supply Valve with Portion of Shell Cut Away to Show Working Parts

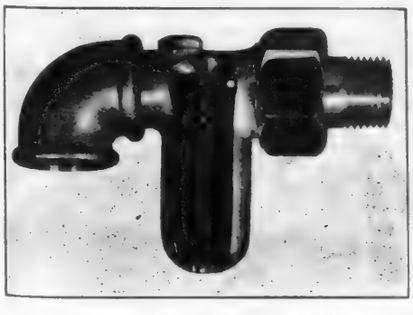
The vapor inlet to the valve is provided with a restrictor in which slots are cut. These slots vary in size and number in the different valves. This arrangement has been found sufficiently accurate in assigning valves to radiators of various sizes. Fractional heating of the radiators is made possible by the design of the valves.

At the return end of each radiator is a water-seal trap, with a small by-pass opening for the discharge of air from the radiator. The trap is deep enough to withstand a pressure of 1 oz. at the return end of the radiator, which is sufficient for vapor-heating requirements, with this system.

Thermostatic return traps are furnished for special purpose heating units, when required, but are not ordinarily used, as it has been found that the water-seal return trap, without moving parts, will function indefinitely, without requiring any attention.

SPECIALTIES ONLY CAN BE USED WHERE MAKERS SUPPLY PLANS

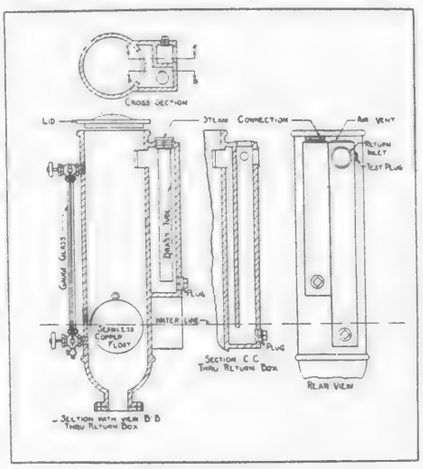
Proper engineering of every Veco installation is insured by requiring every lay-out to be prepared by the manufacturer, and when the contractor has installed the work according to the plans, and it has been approved, the Vapor Engineering Company assumes a guarantee for its successful operation, which, with most heating systems, is an obligation of the heating contractor.



Cutaway Veco Return Seal

With this type of vapor system, it is essential that the piping be installed entirely free from traps or pockets to permit free circulation of the vapor. Pipes may be pitched either uphill or downhill, depending on conditions at the building. In either case, circulation is noiseless.

The maximum pressure to be carried on the plant, to fulfill the guarantee, is 6 oz. The vapor, having a free outlet from the boiler, assisted by the suction on the return line, does not create any pressure on the boiler until the radiators and piping are filled, and the pressure which is then built up is used mainly for operating the draft controls. The average system operates with the control set to close the drafts when the boiler pressure reaches 2 oz. This control is very sensitive, as the copper float



Veco Governor

in the governor responds to the slightest variation of water produced by varying pressure in the boiler.

This system was developed and is manufactured by the Vapor Engineering Co., 489 Fifth Ave., New York.

New Publication

INSTALLING OIL HEAT is the title of a manual for the information of architects, builders, heating engineers and oil men, issued by the Oil Heating Institute, New York. It is published under the authorship of C. Stanley Taylor, of the architectural firm of Lyon & Taylor, New York.

Discussing the basic requirements for successful installations, the booklet says:

"Where oil-heating apparatus is installed in existing boilers, the architect must adapt the burner by selection and adjustment to meet existing conditions. Vast improvements have been made in domestic boiler and furnace design in recent years which have greatly increased their efficiency. The installation of an oil burner in a poorly-designed boiler or furnace naturally will limit the efficiency with which the heat units in oil are employed. Where the architect has an opportunity to make a new installation, as in the case of a new home being constructed under his direction, he can select modern boilers or furnaces especially adapted to oil heating.

"Obviously, a correct installation by the dealer is of paramount importance. As much attention should be paid to this one factor as to any other, for upon it depends the successful operation of the equipment. Similarly, the subsequent service and maintenance of the equipment is a substantial part of the problem, and the best results will be secured only when the owner is willing to place all maintenance and service problems in the hands of service men supplied by the selling organization."

The contents of the manual cover the relative cost of oil fuel, as compared with coal, based upon the studies of the United States Bureau of Standards. It discusses the principles of combustion, how the selection of an oil burner is governed by various types of boilers, furnaces and chimneys, safety devices and automatic control.

The following qualifications are suggested for dealers:

"1. Be sure the dealer is financially responsible and likely to remain in business for an indefinite period.

"2. Ascertain through investigation of previous installations that the dealer is competent to make a correct installation and to guarantee his work.

"3. Investigate the service rendered by the dealer's maintenance force and take into consideration the distance from the dealer's headquarters to the installation."

A. E. S. C. Becomes American Standards Association

Reorganization of the American Engineering Standards Committee, in order to keep pace with the growth of industrial standardization in this country, is now under way. William J. Serrill, chairman of the committee stated that fundamental difficulties inherent in the old organization would be eliminated when the operation of the committee was placed on the new administrative basis. The objects of the association will be to provide systematic means by which organizations engaged in industrial standardization work can co-operate in establishing American standards in those fields in which engineering methods apply, and to further the industrial standardization movement as a factor in advancing national economy.

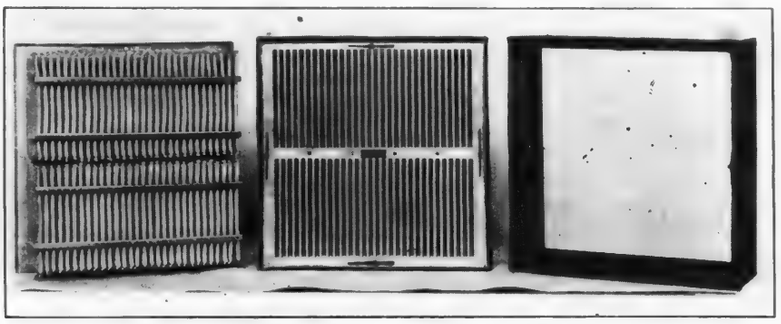
New Apparatus and Appliances

A Novel Dry Air Filter

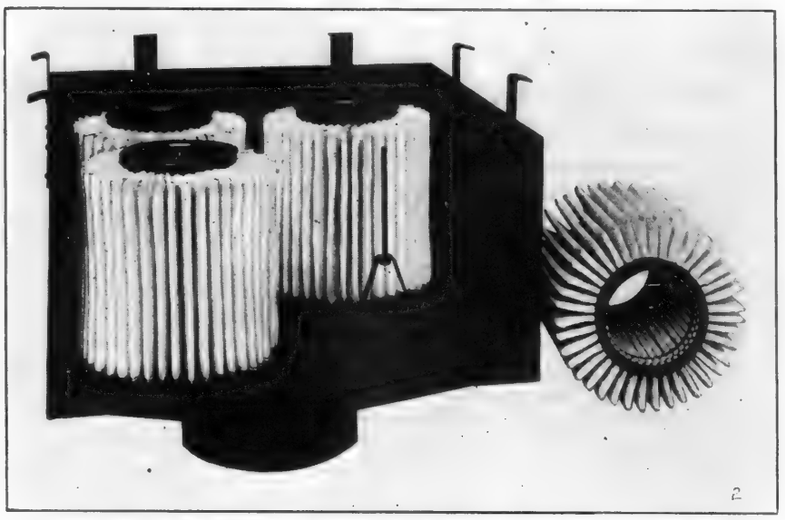
Designed to remove a high percentage of dust and dirt from the air drawn through it, the Protectomotor industrial unit closely follows the basic design of the filter designed for automotive purposes, of which more than 200,000 have been sold by the Staynew Filter Corp., Rochester, N. Y.

In the original design the filter consisted of a cylindrical shell from which extended hollow radial fins, fabricated from wire screening. Over these fins was drawn a felt filter medium, through which the air drawn into the central pipe must pass. This arrangement provides a method of mounting a relatively large area of felt in a compact space, and a system of support which allows the use of the entire available area of felt with an almost negligible restriction. Slightly less than a cubic foot is required for 20 sq. ft. of filter material. These filter units are assembled in "gangs" of any required number. Each unit is designed to pass 250 cu. ft. of free air per minute with a pressure drop not greater than ½ in. of water.

To handle larger volumes of air, units are made up on rectangular frames with parallel hollow fins. Panels are supported in heavy pressed-steel frames mounted to suit the space available. It is claimed that the efficiency of these units is in excess of 99%. Cleaning is thoroughly and quickly done by a high-suction cleaner, operating through a special nozzle which passes over the face of a panel where the openings into the pocket are located. The surface is not touched by the cleaning nozzle and the operation is carried on without removing the panels from the frames. It is stated that a panel can be cleaned inside of one minute. The resistance of the cleaned filter to air flow is not in excess of ¼ in. water gauge.



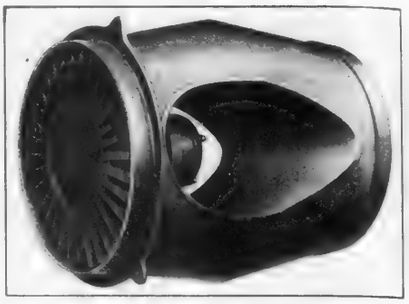
Rectangular Type Protectomoter Air Filter Units



Felt Air Filtering Media in Protectomoter Are Disposed to Provide Large Area in Small Volume

Special Duct for Ventilating Jobs

Designed for installation where fumes of excessive temperature or of a corrosive character are to be removed, the De Bothezat Bifurcator, made by the De-



This Bifurcated Duct Protects the Fan Motor from Corrosive Fumes

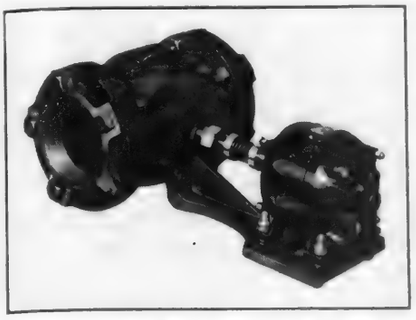
Bothezat Impeller Co., Inc., 1922 Park Ave., New York, is of particular value in that it permits the use of a straight-away duct. The motor is direct-connected to the fan by a short shaft, and is kept from contact with the fumes by being placed in a chamber opening transversely to the surrounding air. The chamber is streamlined to reduce the friction loss, while the bifurcated duct around the chamber is enlarged so as not to restrict the duct area.

Schutte & Koerting Low-Level Eductor Condenser

Designed to handle steam and vapor at high vacuum, a low-level eductor condenser has been placed on the market by Schutte & Koerting Co., Philadelphia, Pa. This condenser gives satisfactory performance when operated as a water heater with water supply at a pressure from 1 to 15 lbs. per sq. in., and with steam at pressures ranging from 15 in. vacuum to 11 lbs. gauge. During cold weather the condenser discharge, which acts as the heating medium, is kept at a high temperature. The condenser discharge passes through a check valve into a storage tank, after which it is pumped through the heating system, returning at a temperature sufficiently low to permit its use as injection water. In hot weather the condensing water is drawn from a cold well and discharged into a hot well, since the heating system would not be in use.

Ketchum Compeller

Designed to counteract the conditions which make for sluggish circulation in hot-water systems, the Ketchum compeller, manufactured by the Sterling Engineering Co., Milwaukee, Wis., consists of a motor-driven impeller set in a housing, which forms a portion of the flow line of a water heating system. The housing forms an enlargement of the line at this point and the bronze impeller, which is driven by a motor mounted on the housing, is so shielded by a bronze plate that when the motor



Circulation in Water Heating System Is Stimulated by the Ketchum Compeller

is not running no resistance is added to the flow by the impeller being in the system. It can be cut in automatically or otherwise, as desired. When burning fluid fuel, the compeller motor may be controlled with the oil-burner motor by the room thermostat, so that the compeller is running only when heat is being supplied. This device is regularly furnished with 4-in. or 6-in. inlet and outlet connections, but reducing companion-flanges suitable for 2-in., 2½-in., 3-in., 3½-in., or 5-in. pipe connections can be furnished as required.

Mounting for Lincoln Arc Welder

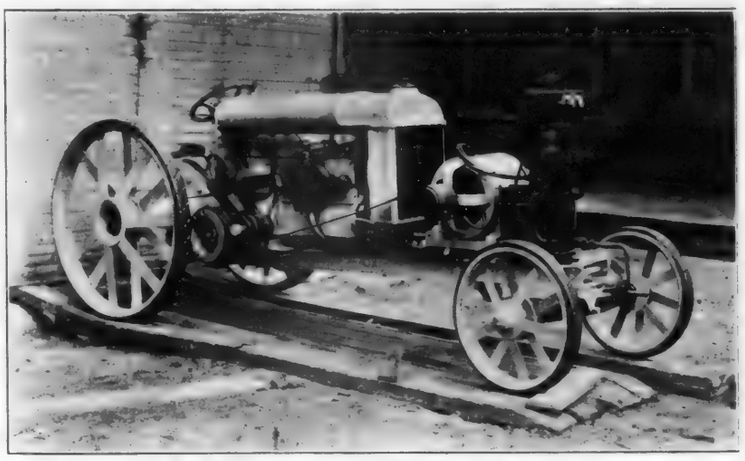
A new mounting for the standard Lincoln electric arc welders is announced by the Pontiac Tractor Co., Pontiac, Mich. Such a mounting is of particular interest to heating contractors using Lincoln welders as the unit now may be made self-propelled and capable of hauling heavy loads behind itself. The welder unit, together with the stabilizer and panel, is mounted on the frame which attaches either to a Fordson or McCormick-Deering 10/20 tractor, using rubber-tired wheels or crawlers for soft ground work as desired. Power is taken from the tractor to drive the welder through a take-off pulley, a clutch being interposed between the tractor and pulley. A number of these units have been in use for four years on pipe-line construction and steel fabricating.

Electric Hammer Speeds Installation Work

Both the heating contractor and the oil-burner installation crew will find many applications for the new electric hammer announced by Black & Decker Co., Baltimore, Md. This hammer strikes 2300 sharp, hard blows a minute contrasting with 50 or 60 less effectual blows per minute, struck by the average workman with a sledge hammer. Tests show that this hammer will cut a 1-in. hole in concrete at the rate of 3 in. per minute, or in brick at the rate of 8 in. per minute. A 3-ft. by 10-ft. hole was cut in a 12-in. reinforced concrete floor

Using Black & Decker Electric Hammers When Installing an Oil Burner

in 8 hrs., and an average of better than one hole per minute was made for theater seat expansion bolts 9/16 in. diameter and 2½ in. deep.



Portable Lincoln Welding Outfit

Temperature of a Heating Medium Is Maintained Constant by an American Temperature Controller

American Precision Temperature Controller

To meet the growing demand for a temperature controller which is self-contained, accurate, and reliable, the American Schaeffer & Budenberg Corp., 338 Berry St., Brooklyn, N. Y., announces the American precision temperature controller. This device essentially consists of a bulb, in which is contained a volatile fluid, bellows connected to the bulb and operated by the expansion of the fluid, a spring against which the bellows expands, and a throttling valve in the line containing the heating medium and which opens or closes as the bellows expands or contracts. Made of copper, the bulb comes equipped with a union connection. The bellows is of phosphor-bronze; its durability is demonstrated by the fact that a standard bellows under test made sixty million strokes before failing. The valve is made of bronze, and is of the double-seated, balanced type.

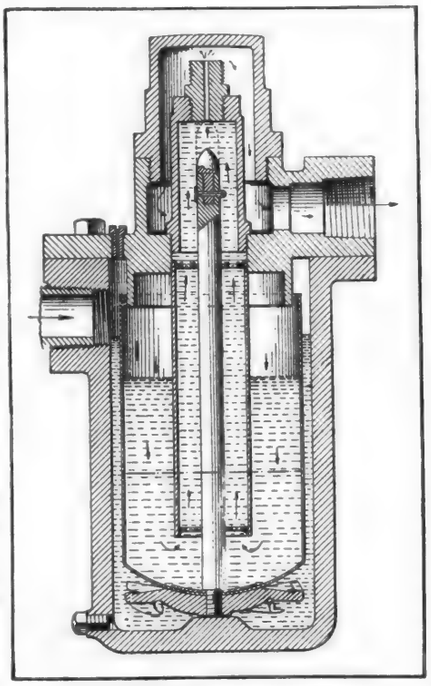
To guard against damage to the bellows from overheating of the bulb due to the pressure of the volatile fluid, a safety spring is placed between the upper and lower parts of the valve stem. This spring takes up any additional expansion of the bellows which may take place after the valve is closed. The large spring against which the bellows expands under normal use is long, of large diameter, and Parkerized to prevent corrosion.

In connection with hot-water storage tanks, water heaters, washers, vats, retorts, and kilns, these controllers are especially valuable. Standard temperature ranges run in increments of 50° from 50° to 385° F. Either direct or reverse-acting valves can be supplied.

Trerice Steam Trap

A steam trap, in which the valve is designed to turn and seat in a different place after each discharge, has been developed by H. O. Trerice Co., 1338 West Lafayette Blvd., Detroit. In this trap the water enters the casing, raising the level in the trap body until it overflows into the bucket, which has been floating and keeping the valve closed against its seat. When the bucket is sufficiently filled, its buoyancy is overcome and it sinks, opening the valve. The trap now discharges the condensation until the water level in the bucket falls to a point where it will float it up and close the valve again.

Attached to the bottom of the bucket is a small aluminum propeller. When the bucket drops, the action of the water against the propeller blades causes it to rotate. The valve, which is fastened to the bucket, consequently is rotated and seated in a different position at every discharge of the trap. As the valve is rotating at the time of closing there is a definite tendency to clean and burnish the seat, keeping the trap steam-tight.



Section of Trerice Steam Trap

"Convoswitch" for Control of Oil-Burning Systems

Designed primarily for industrial buildings, garages, warehouses, and factories heated by oil, where a wider temperature range is desired than may be obtained with the usual thermostat, the Convoswitch, made by the Absolute Contactor Corp., Elkhart, Ind., is now available. A temperature scale is attached to the instrument reading from 40° to 100° F. and the total variation from the temperature to be maintained is 5°. The actuating force which rotates the mercury switch is caused by the expansion and contraction of the bimetallic spiral. In industrial installations, where the ratings of the burner motor exceed the rating of the Convoswitch, the Convoswitch may be used in connection with a relay or it may be used to control a magnetic starter when wired in series with the closing coil.

Automatic Oil-Burner Control for Industrial Applications

Pipe Dies Introduced for Brass Pipe Only

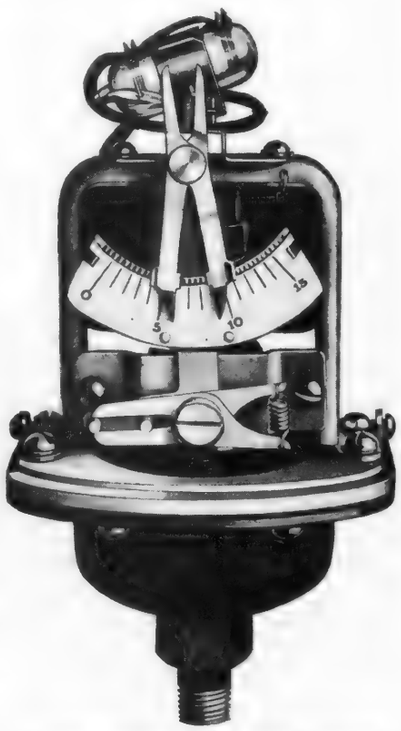
The Armstrong Mfg. Co., Bridgeport, Conn., has designed and placed on the market a line of dies which are to be used on brass pipe only, the essential difference between these dies and those for iron pipe being in the cutting angle. Fitters using these dies can cut smooth, perfect thread if they are used only on brass, lard oil being used as a cutting medium. Armstrong stocks such as are used for iron pipe dies can be used also with the brass pipe dies.

Reed Streamline Air Filter

An improvement in the method of flushing the Reed Streamline air filter, has been made by the Reed Air Filter Co., Louisville, Ky. To insure the flow of oil required over the baffles it is necessary to maintain a head of 2 in. in the distributor. Formerly the oil was pumped directly into the distributor, necessitating fairly large pumps and motors. The new automatic flusher, by storing the oil in a special compartment at the top of the filter and releasing it instantly, not only gives a greater head in the distributor but also makes possible the use of smaller equipment, and requires the use of less Adhesine than formerly was needed. No change has been made in the method of cleansing the air or in the design of the baffles. Series "A" filters are made in capacities from 3000 to 60,000 c.f.m.

Minneapolis-Honeywell Pressuretrol

A steam boiler pressure limit device, the Type "H" Pressuretrol, is announced by the Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. This is of the enclosed contact, mercury-tube type, supplied either for high or low voltage circuits, with an operating differential of about 4% of the maximum scale reading. Scissor-type indicator hands, mounted underneath the cover of the instrument, provide an easy method of setting, while the fact that the hands are concealed will overcome the tendency of the homeowner to tamper with the adjustment. A strain-release mechanism is incorporated in the design to absorb the distortion tendency due to the additional pressure building up after the burner stops —or to the pressure receding below the low setting when the burner starts.



A Steam Boiler Is Protected Against Excessive Pressure by the Pressuretrol

Knowles Aerovalve Mushroom Air Diffuser

An air diffuser, which may be set for the desired air volume simply by turning an adjusting screw in the top, has been placed on the market by the Knowles Mushroom Ventilator Co., 202 Franklin St., New York, and is known as the Aerovalve mushroom air diffuser. Supplied in three styles, an Aerovalve can be obtained to meet the contractor's special problem; one style, of rolled steel, can be secured by masonry nails to the floor; the second style is the same as the first with the addition of a galvanized sleeve which is grouted into the concrete floor at the time of pouring and to which the diffuser later is attached; the third style is the same as the first except that the sleeve regulator is omitted. Regulation is obtained, in the first two types, by turning a screw in the top which moves a sleeve vertically, thus increasing or decreasing the area of the opening. All three styles are obtainable in two sizes, 6 in. and 8 in. dia.

Sarco Steam Traps

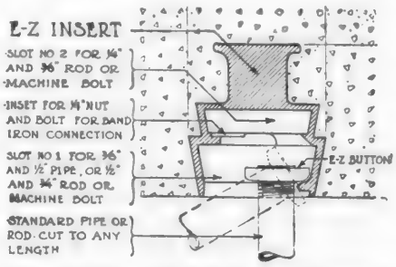
A new combination float and thermostatic steam trap and a new process steam trap have recently been placed on the market by the Sarco Co., New York. The float trap, Type FT, is recommended for the ends of steam mains, Vento stacks and large unit heaters. By means of a thermostatic by-pass the float trap will also relieve itself of air. The bellows, or thermostatic element, is of the usual Sarco design. Type S-75 is a trap designed for process-steam installations with pressures up to 75 lbs. Monel metal is used for the valve-head and seat and the outside of the body is nickel-plated. This trap has a large valve area and a quick lift when discharging.

H. B. Smith "144" Radiators and Boiler Jacket

Slender type radiators, designated as "144" because they have 144 sq. in. of surface to every sq. ft. of rating, and a line of jackets for H-B round boilers are announced by H. B. Smith Co., Westfield, Mass. The "144" radiators are available in 3-, 4- and 6-column types. The insulated jackets, finished in mountain-ash scarlet, can be supplied for all but the smallest size of the H-B round boiler.

E-Z Concrete Insert

A universal concrete insert, so designed that one size will answer requirements for all pipe hangers, and with


E-Z INSERT
SLOT NO 2 FOR 3/8" AND 3/8" ROD OR MACHINE BOLT
INSET FOR 1/2" NUT AND BOLT FOR BAND IRON CONNECTION
SLOT NO 1 FOR 3/8" AND 1/2" PIPE, OR 1/2" AND 3/4" ROD OR MACHINE BOLT
STANDARD PIPE OR ROD CUT TO ANY LENGTH
E-Z BUTTON

Cross Section of E-Z Concrete Insert as Installed

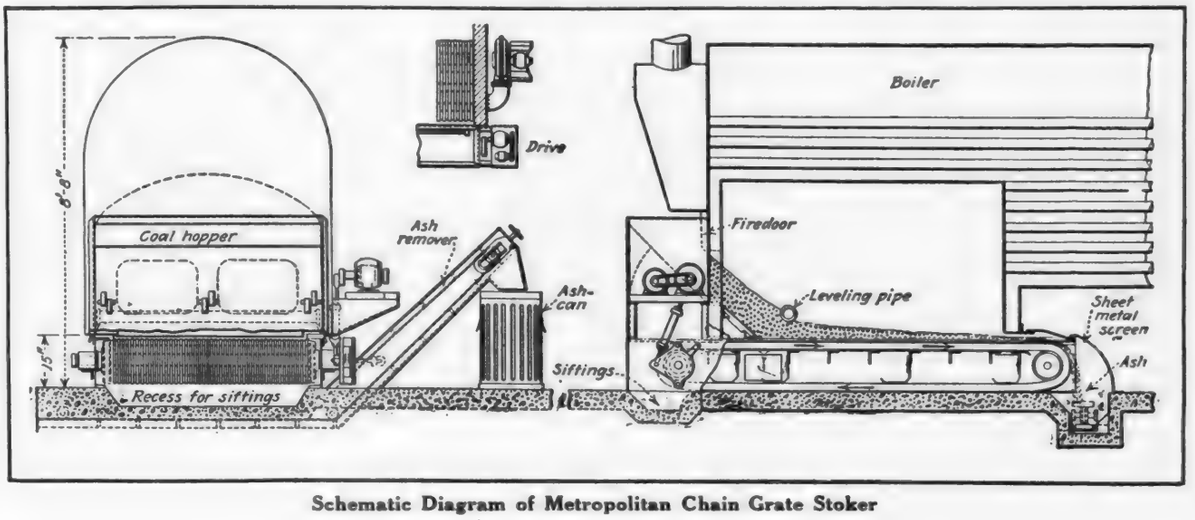
ball-and-socket connection between the insert and hanger, is announced by the Healy-Ruff Co., 772 Hampden Ave., St. Paul, Minn. This device is fully adjustable, allows for play to overcome expansion and inaccurate alignment of inserts, and is known as the E-Z insert.

Arco Packless Radiator Valve

American Radiator Co., New York, has announced an Arco packless radiator valve No. 999, a particular feature of which is the exceedingly gradual pitch of the operating member on the stem. Because of this thread angle, one turn of the handle is sufficient to open wide or tightly close the valve. Designed to give a minimum return-flow friction, this valve is particularly well suited for one-pipe steam jobs. Other features include a composition heat-resisting handle, a non-rusting spring, short thread engagement, which minimizes friction, and an attractive appearance. This valve can be obtained in sizes from ½ in. to 1½ in., in angle, globe, or corner type, for steam or water systems, and with fractional control if desired.

Chain-Grate Stoker for Large Heating Boilers

In the Metropolitan stoker, the Boiler and Stoker Engineering Co., Grand Central Terminal, New York, has developed a traveling-chain-grate stoker which can be used in large heating boilers in which stokers formerly could not be used on account of the limited headroom available for the ignition arches. Fuel is fed to an over-feed grate section, and thus introduced on top of the burning fuel, igniting from the bottom, a method which, it is claimed, gives more rapid ignition than is obtained by the use of the ignition arch. After ignition the chain grate carries the fuel under the leveling bar, where the fuel bed is set and the bed packed down, after which the fuel gradually burns out during its travel. Dampers are provided so that the amount of air supplied to each zone under the grate can be separately adjusted to meet the requirements of that zone. Built in sizes suitable for installation under all types of boilers from 500 sq. ft. of heating surface up, this stoker is designed to permit up to 200% boiler rating when operating under forced draft. Installations can be made in steel heating-boilers where the maximum distance from floor line to mud ring is only 15 in.



Schematic Diagram of Metropolitan Chain Grate Stoker

New Trade Publications

NOVOID CORKBOARD INSULATION is described in a folder issued by the Cork Import Corp., 345 West 40th St., New York. In it are many illustrations showing the use of corkboard, which is manufactured in seven plants in Spain. Raw material, the bark of the cork oak, which abounds in Spain, is ground up and granulated. The granules placed in heavy steel molds, are first compressed under heavy pressure and then slowly baked, in huge ovens, by a special process that brings out the full flow of the natural cork resin, binding the whole mass together into a strong, firm sheet of insulation. No binder of any kind is added. The finished sheet of Novoid corkboard insulation therefore contains nothing but pure cork. It is available in sheets 12 in. by 36 in. and 24 in. by 36 in. in thickness varying between 1 in. and 4 in. Illustrations show the application of this insulating material to the roof and walls of buildings. The text of the leaflet contains much useful and interesting information on the source of supply, process of manufacture and methods of use.

FIELD AUTOMATIC DRAFT CONTROL AND CLEANOUT is the title of a 4-page folder by the Field Mfg. Co., 1319 West Lake St., Chicago. As described, this control consists of a rectangular plate with an arm holding a movable counterbalance on one edge. The purpose of the control is to maintain an even draft in the chimney, regardless of such variable conditions as are encountered on windy days, in foggy weather and with irregular firing. When this control is placed in an opening in the chimney the plate is drawn inwards as the draft increases, because of wind or other reasons, thus enlarging the opening and automatically decreasing the draft. As the draft decreases the plate swings shut and consequently, by closing the opening, increases the draft. Adjustment to the draft, which is to be maintained, is made by moving the counterbalance to the correct position at the time the control is installed. By preventing too much excess air because of too great draft and by allowing the combustible gases to be burned more completely by reducing the draft when the draft is too high, the control is said to effect an appreciable saving in fuel. Standard sizes of these controls are 8, 12, 16, 20 and 24 in., while larger sizes are made to order. An 8-in. control is used for an 8-in. x 8-in. stack, while for an 8-in. x 12-in. stack a 12-in. control would be selected.

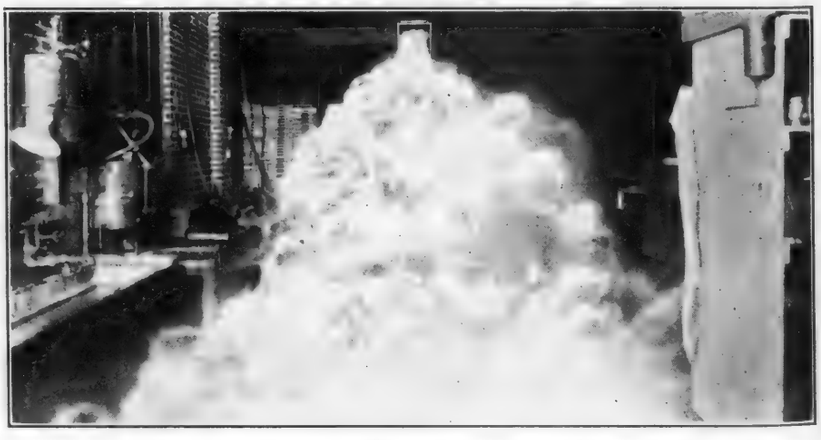
AN INTERNATIONAL INSTITUTION is a well-illustrated and easily-read description of the plant and products of the International Boiler Works Co., East Stroudsburg, Pa. An outline of the principal equipment and photographs from the various departments precede a short description and illustration of the different power and marine boilers, water tanks, stacks, and grates manufactured by this company. A separate folder in colors describes and illustrates the Triple-Service boiler, a steel water-tube unit which is designed for house-heating, using oil or gas as fuel, for burning garbage and for heating domestic water. Both horizontal and vertical water heaters are shown on other folders. Size 8½ in. x 11 in. Pp. 52.

MODINE UNIT HEATERS are described in three new bulletins issued by the Modine Manufacturing Co., Racine, Wis., covering specialized applications. One bulletin is devoted to their use in the leather industry. The second bulletin is devoted to their use in dairy plants. Through the rapid circulation of heated air, the unit heater practically eliminates steam fog and greatly reduces condensation on walls, ceiling and machinery in the dairy plant. Nearly 100 installations in which these results have been produced are listed. A garage application bulletin explains in detail the way unit heaters may be applied to reduce hazards of carbon monoxide gas.

HOW TO CUT HEATING COSTS appears on the cover of a catalog being mailed by The Trane Co., LaCrosse, Wis., featuring the Trane unit heater. Instead of being a technical dissertation, this piece of literature is devoted almost entirely to a photographic presentation of the story, with a concise text emphasizing the salient features of Trane equipment. An interesting page presents concrete figures on the cost of heating with direct radiation and with unit heaters. In one case is cited a garage building 150 ft. by 90 ft., with a repair shop in the basement and display rooms on the first floor. Bids were asked on the basis of heating either with direct cast-iron radiation, or with Trane units. The heating contractor quoted $10,000 for the former and $6,600 for the latter. In another case, in a one-story factory, with saw-tooth roof and sides practically all glass, and having a floor area of 40,000 sq. ft., the estimated cost of direct cast-iron radiation was $8000 and of the Trane unit heating system $5000. For an elaborate dance pavilion, built at a cost of $40,000, bids were asked on a warm-air heating system, direct steam radiation and unit heaters. The bids in respective order were, $5000, $7500 and $4500. Trane unit heaters are made in a midget type, having capacity for a room 10 ft. by 25 ft. with 10-ft. ceiling, under average conditions, while the largest unit will heat a space 100 ft. by 75 ft. with a 19-ft. ceiling, larger spaces requiring two or more units.

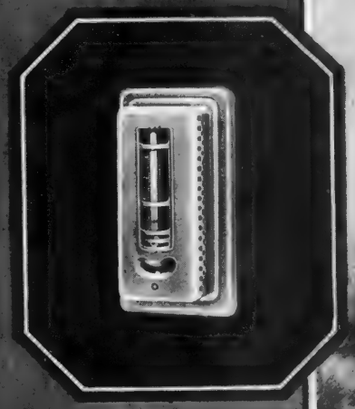
The catalog is a forcible advocate of unit heating and includes mention of the essential details of Trane specialties.

LATTNER GAS-FIRED BOILERS are described in Bulletin 109 issued by the P. M. Lattner Mfg. Co., Cedar Rapids, Ia. There is featured a line of automatic gas-fired boilers designed for special applications in laundries, clothing factories, restaurants, hotels, hospitals and other places where process steam is used. The boiler is built in three types, standard height, low and midget. The midget is built in two sizes, ½ H.P. and ¾ H.P., while the other types are built in sizes rated as high as 25 H.P. This boiler is of the vertical-tubular type and is constructed in accordance with the A.S.M.E. code. The Lattner gas control and gas cut-off and a low-water cut-off also are featured in this catalog.



Smoke Bomb Test of Trane Unit Heater

NEW YORK LIFE INSURANCE COMPANY BUILDING



Architect ▸ CASS GILBERT ▸ ▸ *Engineer* ▸ SAMUEL A. McGUIRE
Consulting Engineers ▸ MEYER, STRONG & JONES

Insurance Against Overheated Rooms

Simplicity of construction, durability and long service without repairs are some of the features which caused the selection of the Powers System in preference to others for use in this building.

Graduated control is employed throughout. Powers control can be depended on to give many years of reliable service without expert attention and the user is insured the maximum return on the investment in heat control.

THE POWERS REGULATOR COMPANY

35 Years of Specialization in Temperature Control

NEW YORK CITY: 137 East 46th Street CHICAGO: 2718 Greenview Avenue

Offices in 35 Other Cities

The Canadian Powers Regulator Company, Toronto, Ontario

(4144)

POWERS

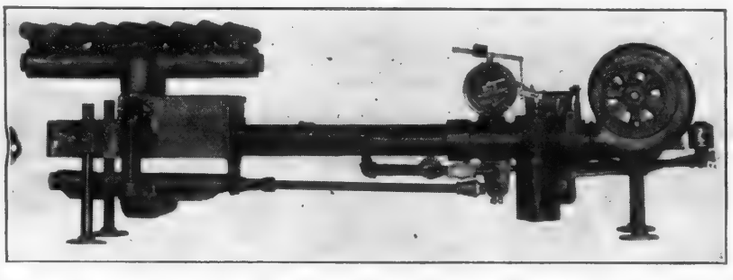
, COOK METAL BELLOWS are described in a comprehensive catalog issued by the Cook Electric Co., 2700 Southport Ave., Chicago. This features the fundamental design and the construction of Cook metal bellows of phosphor bronze, monel and steel and the many applications to which they are adapted. These bellows are made from flat-rolled sheets of comparatively hard temper and care is taken not to impair the temper in the process of forming the flanges or making the joints. The result is a bellows of great durability. Cook bellows are made in a number of sizes and to any lengths. Of the many applications, illustrations are shown of bellows used in pressure-regulation valves, pneumatic or hydraulic cylinders for remote or automatic controls, pressure and vacuum gauges, air-operated chucks, a flexible motor-coupling, noiseless in operation and without back-lash, and several interesting applications for small pumping units. Steam valves for the control of heating coils and radiators, steam taps and oil control valves are in use, and anti-siphon valves are available for use with oil-burning installations. The catalog is voluminously illustrated and contains all essential data on this complete line of specialties.

COLD FACTS ON A HOT SUBJECT is the title of a bulletin issued by the Bayley Blower Co., Milwaukee, Wis., dealing with Chinook-Fin heaters. In it are featured the design, construction and operation of these units which are characterized by the copper tube radiating surfaces with extended copper fin surface. Each individual radiating tube is expanded into a special bushing and each tube encloses a small circulating pipe through which steam is conveyed from the steam chamber to the outer end of the circulating pipe. The flow of steam, water and air is always in the same direction, consequently there are neither counter currents, air traps nor water hammer.

A BETTER WAY TO HEAT YOUR HOME is the title of a catalog issued by The Duplex Oil-Gas Burner Mfg. Co., Evanston, Ill. In it is featured an unusual type of oil burner in which a Bunsen-type flame is continuously maintained with automatic temperature control. The burner consists essentially of a motor-driven blower, with the necessary control system installed just outside of the ash pit, and, inside the ash pit, a vaporizing retort, above which is a manifold distributing pre-mixed air and hydro-carbon gas to the burner bars, which are tubes taking gas from the manifold and burning it through small holes. The non-luminous flame thus produced is similar to that of the ordinary gas burner. It is stated that, in emergency, either manufactured or natural gas can be burned.

CAR HEATERS are described in a catalog issued by The Peter Smith Heater Co., Detroit, Mich. These heaters are in reality miniature water boilers and are designed to provide heat in the ever-increasing number of Diesel-electric, storage battery and gasoline motor rail cars. In the foreword it is stated that this company has manufactured this type of equipment since 1881. The unit consists of a steel boiler shell with copper-tube heating coil. The company also manufactures a special expansion chamber. Diagrams are given of various types of hot-water circulating systems that have been evolved for this highly-specialized form of heating. There also are described forced ventilation warm-air car heaters in which a Sirrocco-type fan is driven by a motor, both being mounted on top of the air heater. The air blast is forced down over the exterior of the combustion chamber, the warm air emerging from the heater at the floor level. This entire line of equipment has been carefully worked out through many years of experimentation and use to meet the unusual and severe demands placed upon it by the conditions under which it operates.

ABOUT THAT OIL-BURNING PROBLEM is the title of a circular issued by the Simplex Oil Heating Corp., 30 Church St., New York. Simplex burners are of the gun type, the oil pump and fan, driven by an electric motor, being installed as a separate unit. The circular includes photographs of many Simplex-heated buildings.



Duplex Oil-Gas Burner Gasifies Oil in a Retort and Produces a Bunsen-Type Flame

BAL-DRAF is the title of a catalog issued by Bal-draf Mfg. Co., 441 Broadway, Milwaukee, and descriptive of the balanced damper manufactured by this organization. This device consists of a rectangular casing, with a circular hole in the top, which can be opened or closed by a circular disc hung on the end of a weighted arm. On one side of the case is a second opening with a sleeve for attachment to the chimney. As an optional arrangement, Bal-draf can be installed between the smoke pipe and the chimney, the entire flue-gas from the boiler passing through it. By moving the weight along the arm, a condition of balance can be established to meet the requirements of any individual boiler attached to any chimney.

FACTS ABOUT THE DUNHAM DIFFERENTIAL VACUUM HEATING SYSTEM are presented in a bulletin issued by C. A. Dunham Co., 450 East Ohio St., Chicago. This booklet features advertisements of the Dunham Company, in each of which one or more features of the Dunham differential vacuum system are emphasized.

MAGIC BOILER PRESERVATIVE is described in a catalog issued by Garratt-Callahan Co., San Francisco, Calif. "Magic" is a thick, heavy liquid, weighing 12 lbs. to the gallon, containing no acids; is mechanical in action, not chemical, and is always soluble in water. In solution, under high temperature, this material has a high affinity for metal and forms a protective film on boiler tubes and shell. It is stated that this compound introduced into the boiler prevents the continual building up of scale from precipitated crystals of sulphates, carbonates and magnesias. Its action, it is said, is mechanical rather than chemical in dislodging scale that may be present on the boiler tubes. Being non-volatile, it will not evaporate or carry over with the steam.

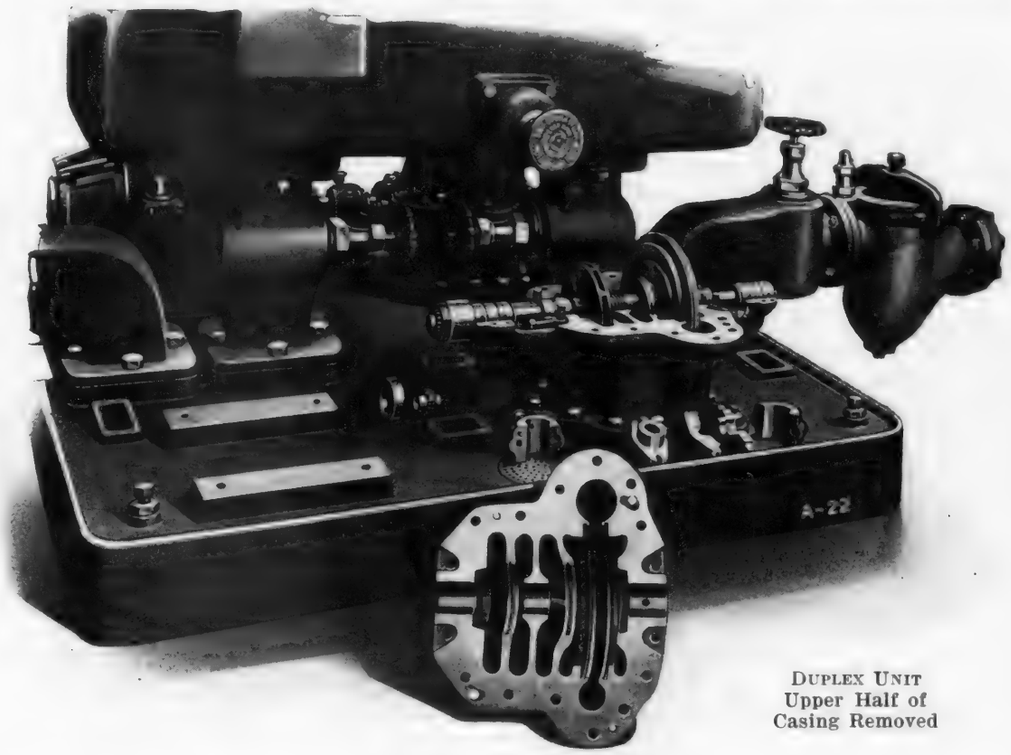
The use of "Magic" goes back more than twenty years, when it was used on a locomotive in the Far West, since which time thousands of locomotive boilers have been treated.

The material is used by connecting a container of the proper size to the suction line of the boiler feed-pump, into which "Magic" can be mixed with water and fed into the boiler immediately following the blowing of the boiler.

PAGE VOLUNTEER and MONARCH BOILERS are described in a small circular issued by the Wm. H. Page Boiler Co., 200 Madison Ave., New York. In this brochure are illustrated and briefly described the round and rectangular sectional boilers for heating and the Page radiators.

The AMES Pump

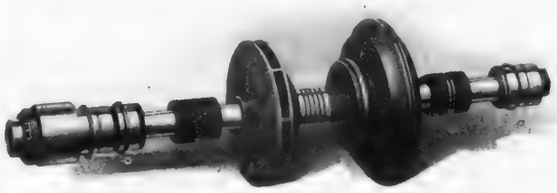
A Vacuum Heating Pump of Excellence



DUPLEX UNIT
Upper Half of
Casing Removed

SIMPLICITY **is the Keynote of Ames construction throughout.**

Architects and Engineers alike have been quick to recognize and appreciate the many constructional advantages and ease of operation of the Ames Pump. The careful application of engineering experience to design, materials and workmanship has produced a vacuum heating pump that is not only unbelievably simple, but highly efficient.



COMPLETE ROTATING ELEMENT

Other AMES features are: easy accessibility to all operating parts —and a *Three Year* Guarantee.

Write for Bulletin 52-C8

AMES PUMP COMPANY, Inc.

Division of STATEN ISLAND SHIPBUILDING CO.

90 West Street New York, N. Y.

DISTINCTIVELY DIFFERENT

BETTER INVESTMENTS is the caption on a little folder alleged to have been written by "Mr. B.T.U." and issued by the Banner Rock Products Co., Alexandria, Ind. In this booklet is given an interesting outline of the various insulating products manufactured by this company and based on argillaceous limestone, found in particularly large quantities at Alexandria, Ind. This raw material is melted in high-heat furnaces and blown into tiny fibres by means of high-pressure jets. The resulting "Banroc Wool" is a highly efficient thermal insulation consisting of fine glass-like fibres of rock material, the aggregate containing tiny air cells comprising about 92% of the total volume. Naturally the material has a very low thermal conductivity and, being entirely a mineral product, is free from decay or deterioration; also it is not subject to chemical reactions which cause disintegration. Some of the original rock wool, first manufactured in 1896, is still in use and in excellent condition. Banroc Wool is fireproof and can be used with any temperatures from 275° F. below zero to 1200° F. above zero. In its final form this insulation is available in sheets, as a jacket to be applied to flat surfaces such as boilers and furnaces, in fabricated pipe coverings, in tank jackets for hot-water tanks, as an insulating cement, and finally under the trade name "Hominsul" as a dry insulation to be applied to the insulation of buildings.

IT HAS ARRIVED is the title of a circular issued by The Bristol Co., Waterbury, Conn., describing a new small-size portable temperature recorder, to be known as Model 144. This instrument uses a 4-in. chart, much smaller than usual. The chart secures a continuous record for 72-hours during which time the instrument requires no attention.

The measuring element consists of a bi-metallic helix which is positive in operation and extremely sensitive to temperature changes. The penarm is attached to the measuring element and records directly on the chart without the aid of any intervening multiplying devices.

A Seth Thomas clock has been especially designed for this instrument and has all parts plated with rust-proof preparation. The clock key is permanently attached to back of the instrument case. The case is equipped for a handle for convenience in carrying and a leg rest so that it can be set on horizontal surfaces. The case is of aluminum with black enamel or white enamel finish as desired. The Model 144 can be had with four chart ranges, from 25° to 125°, from 50° to 90°, from 30° to 70° and from —20° to 80° F. An illustration of this instrument appeared in THE HEATING AND VENTILATING MAGAZINE for March in connection with a mention of Bulletin 363, issued by The Bristol Co., describing the company's recording instrument for use in power plants. Obviously, the power plant instruments are of fixed type and much larger and more elaborate than this portable instrument.

MAFTEX ROOF AND WALL SHEATHING is the title of Architects' Bulletin No. 3 issued by MacAndrews & Forbes Company, 200 Fifth Avenue, New York. This bulletin is an elaboration of earlier literature and presents a complete story of

Testing the Strength of a Maftex-Plaster Bond

the manufacture of Maftex, a sheathing material made up in sheet form from roots of the licorice plant. Photographs show the various recommended methods of application of this material, and two illustrations show a distortion test made on similar panels of Maftex and tongue-and-groove sheathing. The bulletin recommends the use of a coefficient of 0.34 B.T.U. per hour, per square foot, per degree difference in temperature, per inch thickness, and cites tests made by Professor Gebhardt and Professor Sloan to substantiate this figure. Illustrations show a method of testing conductivity of Maftex by the hot box and by the guarded plate method, and it is stated that the latter is now used as standard. An interesting test was made to show the bonding strength of Maftex and gypsum plaster. It required approximately 1000 lbs. pull per square foot to separate the two, and even under this load the plaster bond did not break, but the Maftex material was torn apart. An excellent series of drawings accompanies the specifications, detailing how Maftex should be applied.

JUNE WITHIN—JANUARY WITHOUT is the title of an attractive booklet issued by the Cleveland Steel Products Corp., Cleveland, O. This booklet features the Toridheet oil burner and furnishes a concise and well-illustrated story of its construction and operation. This burner is installed in the ashpit of a boiler and consists of a rotating atomizer nozzle, driven by a vertical motor. The combustion ring is built of fireclay, on the grate level, providing proper conditions for combustion. The various elements of the burner are well described and illustrated. Precision construction throughout the machine makes for silent operation and long life.

AUTOMATIC CONTROL OF TEMPERATURE AND HUMIDITY IN PRINTING PLANTS is featured in a circular issued by the Johnson Service Co., Milwaukee, Wis. Attention is directed to the successful operation of Johnson equipment in the plant of the Curtis Publishing Co., Philadelphia, and in the exceptionally large building of the W. F. Hall Printing Co., Chicago. An interesting point is brought out in connection with the plant of James T. Igoe Co., Chicago, where it is stated the offices automatically are kept at 70° F., the bindery and compressing rooms at 75°, set rooms at 80°, the press rooms at 85° and the paper and ink storage at 80°, without variation. It is stated that a fuel cost of $.0215 per sq. ft. per year has been determined in this plant with 21,000 sq. ft. of radiation.

CONTROLLED HEAT is the title of a booklet issued by the Hoffman Specialty Co., Inc., 25 West 45th St., New York, which describes the Hoffman motion picture on controlled heat. In the film, Martin, the progressive heating contractor, is shown getting contracts, and selling heating systems. In the book is recorded the film story including the Hoffman plan, giving in detail just how controlled heat operates.

. . . AND THE BOILER OWNER IS NO EXCEPTION, a folder issued by McDonnell & Miller, Wrigley Bldg., Chicago, calls attention to the McDonnell & Miller duplex water feeder by stating that everyone forgets occasionally so that there is profit for the heating dealer in selling automatic feeders which will not forget to keep the water-line at the proper level. The ability of this feeder to clean itself lies in the construction of the valve, which is of the rotary type of phosphor bronze moving on a Monel seat. Each time the float moves the oscillation tends to grind and polish the seat. Particular attention is called to the feature that permits the steam-fitter to adjust the water-line of the feeder after it is installed. This obviates the difficulty of getting the water-lines of the boiler and feeder to coincide while installing. One of these feeders, the company reports, has been in operation without failure for 16 months in a city where the water is of 38 grains hardness.

THAT Preferred-Hart dealers are never fearful of the future is best exemplified by the amount they invest in building, stock and personnel. They're stayers — not only in this business but with the Hart.

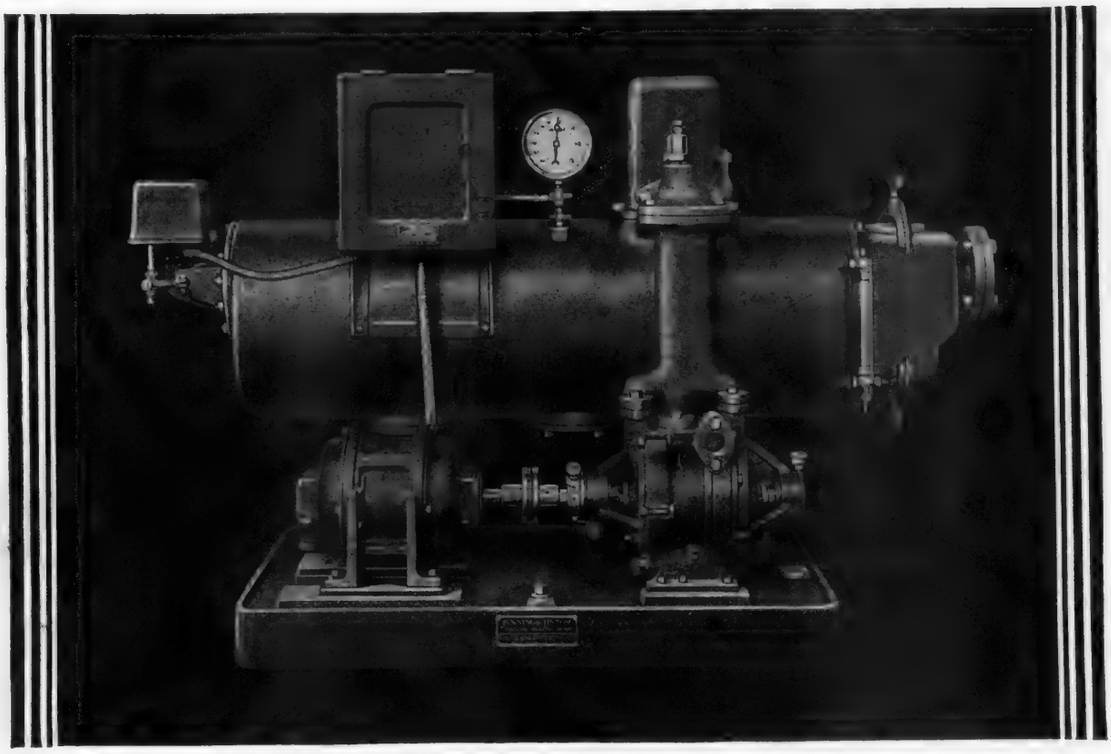
First, because the Hart has ideals of dealer support unheard of and unmatched.

Second, because Preferred-Hart has a complete line that makes every home and building with a heating plant a possible installation.

Third, because dealer's first profits are practically net profits due to the lack of service work these better burners need.

Never in our history have applications for dealer franchises come so fast. Factory output has been speeded up to match these dealer needs. We are better equipped than ever to deliver trouble-free Preferred-Harts that are making dealers money. If you want a proposition unlike that of any other—write for it!

PREFERRED OIL BURNERS, Inc.
PEORIA, ILLINOIS



Jennings Vacuum Heating Pump for return line heating systems. Capacities up to 300,000 sq. ft. radiation.

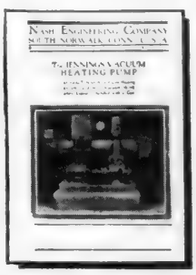
Condensation stored in the tank
—not in the piping

IN the Jennings Vacuum Heating Pump, the returns tank is placed between the system and the pumping unit. *It is not between the pump and the boiler.*

Condensation drains directly into the tank. Here it accumulates—until it reaches a predetermined level when the float controlled switch closes and starts up the pump. The water is then withdrawn from the tank and returned under pressure to the boiler.

Due to the storage capacity of the tank,—the pump is inoperative for a considerable part of the time. An important factor in saving motor current!

Note that condensation accumulates in the tank. *It is not stored in the return line piping.*



Write for Bulletin 71 giving full details of design and operation.

RETURN LINE AND AIR LINE VACUUM HEATING PUMPS ❦ CONDENSATION PUMPS ❦ COMPRESSORS AND VACUUM PUMPS FOR AIR AND GASES ❦ STANDARD AND SUCTION CENTRIFUGAL PUMPS ❦ ❦ MARINE PUMPS ❦ ❦ SEWAGE EJECTORS ❦ SUMP PUMPS ❦ FLAT BOX PUMPS ❦ HOUSE SERVICE PUMPS

Jennings Pumps

THE NASH ENGINEERING CO 81 WILSON ROAD, SOUTH NORWALK CONN.

Trade and Miscellaneous Notes

Coming Events

August 20-September 3, 1928. Regional meeting of the American Society of Mechanical Engineers at the Twin Cities, and a tour of the Great Lakes.

September 17-20, 1928. Second national meeting of the Fuels Division of the American Society of Mechanical Engineers in Cleveland, O.

October 8-12, 1928. Tenth annual convention of the American Gas Association in Atlantic City, N. J. Headquarters at Young's Million Dollar Pier.

October 8-12, 1928. Fall meeting of the American Welding Society in Philadelphia, Pa. Headquarters at the Bellevue-Stratford Hotel, and exhibit at Exhibition Hall of the Commercial Museum.

October 15-19, 1928. Fifty-seventh annual meeting of the American Public Health Association in Chicago, Ill. Headquarters at the Hotel Stevens.

December 3-8, 1928. Seventh National Exposition of Power and Mechanical Engineering in New York. Headquarters at the Grand Central Palace.

January 28-31, 1929. Annual meeting of the American Society of Heating and Ventilating Engineers in Chicago, Ill. Headquarters at Edgewater Beach Hotel.

Miscellaneous Notes

June building operations as reported by the F. W. Dodge Corporation have broken all previous June records, showing an increase of 3% over the June, 1927, record, although this is a decrease of 2½% from the total for May, 1928. The figures for the 37 states east of the Rocky Mountains were $650,466,200. Analysis of this record shows that 40% of all construction was for residential buildings, 20% for public works and utilities, 14% for commercial buildings, and 10% for industrial projects.

In New York State and northern New Jersey, contracts amounted to $175,908,000, which was the highest June figure yet recorded for this district. There was an increase of approximately $800,000 over the amount reported in June of last year, but a decrease of 5% from the total for May, 1928. The New England States report contracts amounting to $41,059,000, which was the second largest June contract total on record, being an increase of 15% over the total for June, 1927, and a decrease of 32% from the total for May of this year.

Contracts in the Middle Atlantic States amounted to $76,443,100, representing the highest June contract total ever recorded in these states. It was a 4% increase over June of last year, but 1% under the total for May of this year. In the Pittsburgh district figures amounted to $78,784,300, being the second largest June contract total on record for this territory, and representing an increase of 19% over the total for May of this year, and a 4% increase over June, 1927.

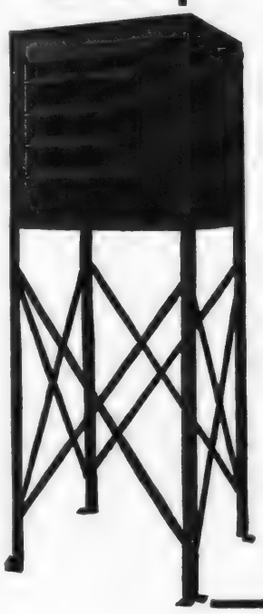
In the Central West, contracts amounted to $192,700,300, which was the second highest June total ever recorded in this district. There was a 1% decrease from the totals for May, 1928, and June of last year. The Northwest reported contracts amounting to $7,749,700, representing a decrease of 18% from the total for May of this year and a 7% decrease from the June, 1927, record.

Figures in the Southeastern States

"Heat with Unit Heaters"

and Heat Efficiently with AUTOVENT

Autovent Unit Heater Floor Type



Plant owners are realizing that UNIT HEATERS heat quicker—heat better—and cost less to buy and operate. It is now a matter of "Which unit heater shall we use?"

To those who are not familiar with Autovent efficiency, here is an expression from a factory owner using Autovent, which is typical of commendations which we constantly receive.

"We are so very much pleased and satisfied with it, that there are no words which could express how much we appreciate this heater.

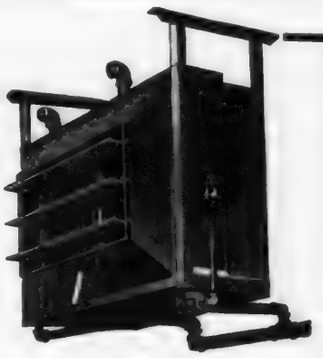
We will always recommend your heater to any of your future prospects."

Autovent Unit Heaters assure ideal working conditions, and the increasing demand offers convincing evidence of the correctness of materials and engineering principles employed.

Send for our catalog 110 fully describing Autovent Unit Heaters, also Uniblade Blowers and Exhausters, Automatic Louvres and Propeller Type Fans.

Autovent Fan & Blower Co.

1805-27 N. Kostner Ave., Chicago, Ill.



Autovent Unit Heater Ceiling Type

ADVANTAGES

Fewer units are needed for equivalent heat radiation; the job is installed quicker, thus saving on labor time.

Fewer traps or valves needed; another important saving in cost.

Less piping, fewer fittings; labor cost further reduced by shortening time required to complete installation.

Overhead installation further reduces cost where floor-space is at a premium.

No hot, over-night fires necessary.

Greater flexibility of control gives more rapid heat spread for same amount of steam used.

Each unit individually controlled and can be shut down when not needed; a vital saving.

Cost of maintenance is less because of fewer units to look after.

amounted to $51,579,600, being an increase of 3% over May of this year and 2% over June of last year.

D. E. McCabe, for 29 years branch manager of the Chicago office of the International Heater Co., Utica, N. Y., has purchased an interest in the Memphis Heating Co., Memphis, Tenn., and has been elected secretary and treasurer.

V. S. Day Associated with Carrier-Lyle Corporation

V. S. Day, formerly professor of mechanical engineering at the University of Illinois, has resigned to become associated with the Carrier-Lyle Corp., 39 Cortlandt St., New York, as engineer of the gas heating division.

Following his discharge from service in the World War, Professor Day has been engaged on the investigation of warm-air furnaces and heating systems, under the co-operative agreement between the university and the National Warm-Air Heating Association. Mr. Day is the co-author of various bulletins of the engineering experiment station, University of Illinois, and is the author of bulletins entitled "Emissivity of Heat from Various Surfaces," and "The Warm-Air Heating Research Residence in Zero Weather."

In addition to this work, Mr. Day also took an active part in the ventilation investigation for the Holland Tunnel, conducted at the university from 1921 to 1924. He is a graduate of the University of Illinois, and a member of Sigma Xi, Pi Tau Sigma, the American Society of Heating and Ventilating Engineers, and the American Society of Mechanical Engineers.

Dr. H. C. Sadler Succeeds Dean Cooley

After 47 years of association with the University of Michigan, Mortimer E. Cooley, dean of the colleges of engineering and architecture, was made dean emeritus by the Board of Regents, May 25, and retired from active service June 30. On June 11, 500 engineers and Michigan alumni gathered at the Book-Cadillac Hotel, Detroit, to pay homage to the Dean, with Charles F. Kettering as toastmaster, and former Secretary of the Navy Denby as the principal speaker.

Dean Cooley will be succeeded by Dr. Herbert C. Sadler, who has been head of the department of naval architecture and marine engineering at the University of Michigan. Dean Sadler came to the University from the University of Glasgow in 1900.

The Late Franklin Pierce Murdoch

FRANKLIN PIERCE MURDOCH, steam heating engineer of Gillis & Geoghegan, New York, for the past 59 years, died at his home in Bloomfield, N. J., July 18, at the age of 76. Mr. Murdoch laid out the engineering work for the steam heating system for the Waldorf-Astoria Hotel and Hotel Plaza in New York. In 1870, the heating equipment was installed by Mr. Murdoch in St. Patrick's Cathedral, and it is interesting to note that fifty years later when it became necessary to make extensive additions to the system it was Mr. Murdoch himself who was in charge of this work.

American Radiator Company's Time Payment Plan

In the establishment of its financing subsidiary, the Heating and Plumbing Finance Corporation, the American Radiator Company has provided a direct means for financing the installation work of the heating contractor. According to this plan, the initial payment on the part of the purchaser may be as low as 10% of the total amount, with periods up to three years for the payment of the balance due. At the same time neither the smaller down payment nor the extended period on the balance affect the contractor, because, in each case, the contractor receives payment for the full amount as soon as the installation is made and approved. To secure the benefit of this financing scheme, it is necessary for the contractor to file a financial statement with the company's branch in his territory. As soon as the contractor's name has been put on the approved list, he can offer time payments to his prospects on a basis of not less than 10% down and a balance in monthly payments extending over a period of from 10 to 36 months.

Upon the completion of a given job, the contractor forwards to the Heating and Plumbing Finance Corporation his note signed by the customer and endorsed by himself, receiving at once the balance due for the work. In connection with the plan, the Finance Company furnishes a form of note to be used with the new selling plan, together with a table of financing charges for periods up to 36 months.

Manning, Maxwell & Moore, Inc., Purchases American Schaeffer and Budenberg

The entire business of the American Schaeffer and Budenberg Corp., Brooklyn, N. Y., has been purchased by Manning, Maxwell & Moore, Inc., New York, and will be merged with that of its subsidiary company, the Consolidated Ashcroft Hancock Company, Inc. This company, owned exclusively by Manning, Maxwell & Moore, Inc., is the operating company handling the manufacture and sales of its steam specialties business, including the lines of Ashcroft gauges, Consolidated safety valves, Hancock valves, etc.

Trane Company Refutes Rumor

In view of rumors that the Trane Co., La Crosse, Wis., had decided to discontinue two of its manufacturing divisions and devote its entire factory capacity to heat cabinets and unit heaters, the company has issued an announcement to the effect that its purpose is to have a complete line of specialties, not only vapor and vacuum heating specialties, but pumps and heating units.

The original and largest division of the company is given over to the manufacture and development of vapor and vacuum heating specialties. There has been developed the Trane bellows radiator trap, bellows-packless valve, direct-return trap, float-drip trap, and many other devices. The business has shown an average increase of 42% each year since 1921.

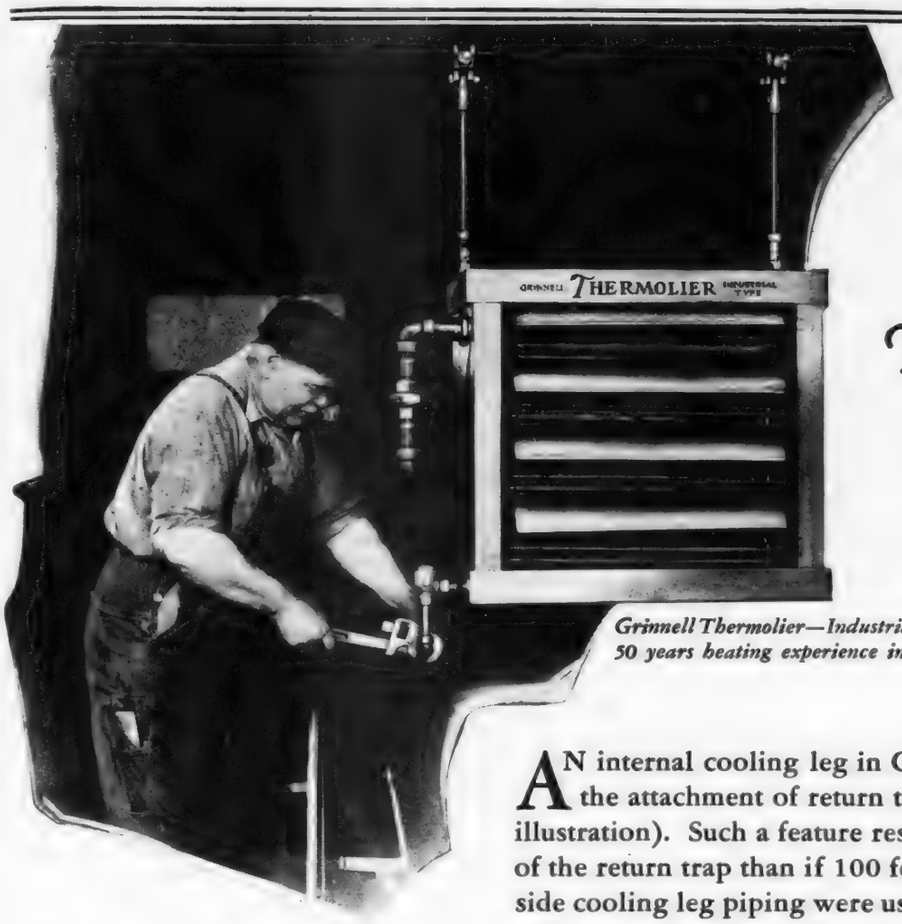
Changes of Address

Sisalkraft Co., Chicago, Ill., has enlarged its headquarters and now is located in new offices at 205 West Wacker Drive, in the new Engineering Building. Sisalkraft is a waterproof, sisal-reenforced building paper.

Kellogg-Mackay Co., Chicago, has moved its St. Paul, Minn., branch office from 142-144 East Third Street to 253-259 East Fourth Street.

Jack: "I don't see how we can put that heater here. There is no place to run the cooling leg piping."

Old Timer: "With a Grinnell Thermolier the cooling leg is right in the unit. The return trap can therefore be square up against the heater."



Grinnell Thermolier—Industrial Type—
50 years heating experience in 4 sq. ft.

The Old Timer Knows

AN internal cooling leg in Grinnell Thermolier permits the attachment of return trap directly to the unit (see illustration). Such a feature results in more efficient action of the return trap than if 100 feet or more of ordinary outside cooling leg piping were used.

Due to unique header construction all condensation must pass through this internal cooling leg. As a result the condensation is cooled by the air blast and the trap will operate continuously, even when the unit is working at full capacity for long periods.

This, however, is only one of the 14 advantages which make the Grinnell Thermolier a better unit heater and one that is very easy to install. A booklet explaining the other 13 points of superiority will gladly be sent upon request.

GRINNELL
PIPE FITTINGS

GRINNELL COMPANY

Executive Offices: Providence, R. I.

Branches in all Principal Cities

14 Points of Superiority

GRINNELL COMPANY, INC.
208 W. Exchange St., Providence, R. I.

I want to read more facts about the Thermolier. Send along the booklet.

Name_____

Address_____

City_____

New Home of the Carrier Engineering Corporation

Carrier Corporation Purchases New Plant

The purchase of a four-story factory and office building with grounds approximating six acres, and with 112,000 sq. ft. of floor space, at 850 Frelinghuysen Ave., Newark, N. J., is announced by the Carrier Engineering Corporation. The company has moved to this new plant which formerly was occupied by the Edison Lamp Works Division of the General Electric Company.

General engineering and executive offices will be located on the fourth floor. The Carrier Construction Company, the manufacturing division of the concern, will occupy a large part of the space for the manufacture of extended-surface heaters and the new Carrier household heating and air conditioning unit. The manufacture and assembly of Carrier centrifugal refrigeration equipment, used extensively in connection with air-conditioning installations, will continue at the former plant at 750 Frelinghuysen Avenue.

Manufacturers' Notes

Lincoln Radiator Corp., Utica, N. Y., which is controlled by the National Radiator Corporation, has moved its plant to larger quarters at North Tonawanda, N. Y.

Wagner Electric Corp., St. Louis, Mo., announces that Alex. L. Miltenberger, formerly Pacific Coast manager located in San Francisco, has been transferred to the St. Louis headquarters as branch manager.

MacGregor Valve Co., St. Louis, Mo., has appointed as production manager J. W. Cliff, formerly shop superintendent of the Merco Nordstrom Valve Co., San Francisco.

James B. Clow & Sons, Chicago, Ill., has purchased a controlling interest in the National Cast Iron Pipe Co., Birmingham, Ala. No changes in policy or personnel are contemplated.

Standard Sanitary Mfg. Co., Pittsburgh, Pa., has appointed E. W. Stitt, formerly representative for the Hoffman Specialty Company, as heating supervisor in the Pittsburgh territory.

Hoffman Specialty Co., New York, announces that Leo J. Potvin has been transferred from the Detroit branch to the Pittsburgh office of the company to succeed E. W. Stitt. Mr. Potvin will be located at 720 Roselawn Ave., Mt. Lebanon, Pa.

H. B. Smith Co., Westfield, Mass., announces that Harry J. Walther, formerly associated with the Henry B. Pancoast Co., Philadelphia, has returned to the company to be identified with the sales staff.

Caloroil Burner Corp., 225 West 34th St., New York, has acquired the Lawrence May Oil Burner Co., Flushing, L. I., New York. This burner will be manufactured at the Caloroil factory in Jersey City, N. J. Lawrence May now is associated with the purchasing company.

Fitzgibbons Boiler Co., Inc., 570 Seventh Ave., New York, will build a foundry adjoining its plant in Oswego, N. Y. Fifty molders will be employed in the new foundry and molding shop.

Cleveland Gas Burner & Appliance Co., Cleveland, O., has appointed John P. Tucker as its southwestern representative, to make contact with the gas companies and the heating and plumbing trade in Texas, Oklahoma, Arkansas, Louisiana, Eastern Mississippi, and Eastern Tennessee. Mr. Tucker formerly was associated with the Fort Worth Gas Company and his address is 1714 Fairmount Ave., Fort Worth, Tex.

Zephyr Washed Air Co., Minneapolis, Minn., has established a distributing agency in Chicago, known as Zephyr Incorporated, located in the Builders' Building. M. C. Barnum, sales manager of the company, temporarily is making his headquarters at the Chicago branch. Another announcement made is that Hart & Crouse Co., Utica, N. Y., has been appointed exclusive distributors in the United States for the Model 1 Zephyr washed-air unit for warm-air systems.

United States Radiator Corp., Detroit, Mich., announces the addition to the sales staff of its Pacific Steel Boiler Division in Philadelphia, of W. A. Coles and F. C. Duemler. Mr. Coles formerly was sales supervisor of the American Radiator Co., New York, and Mr. Duemler was sales engineer of the Heggie-Simplex Boiler Co., Joliet, Ill.

Landon Radiator Co., Inc., North Tonawanda, N. Y., has appointed A. K. Tinker, formerly with the Hoffman Specialty Company, as its Western New York sales manager.

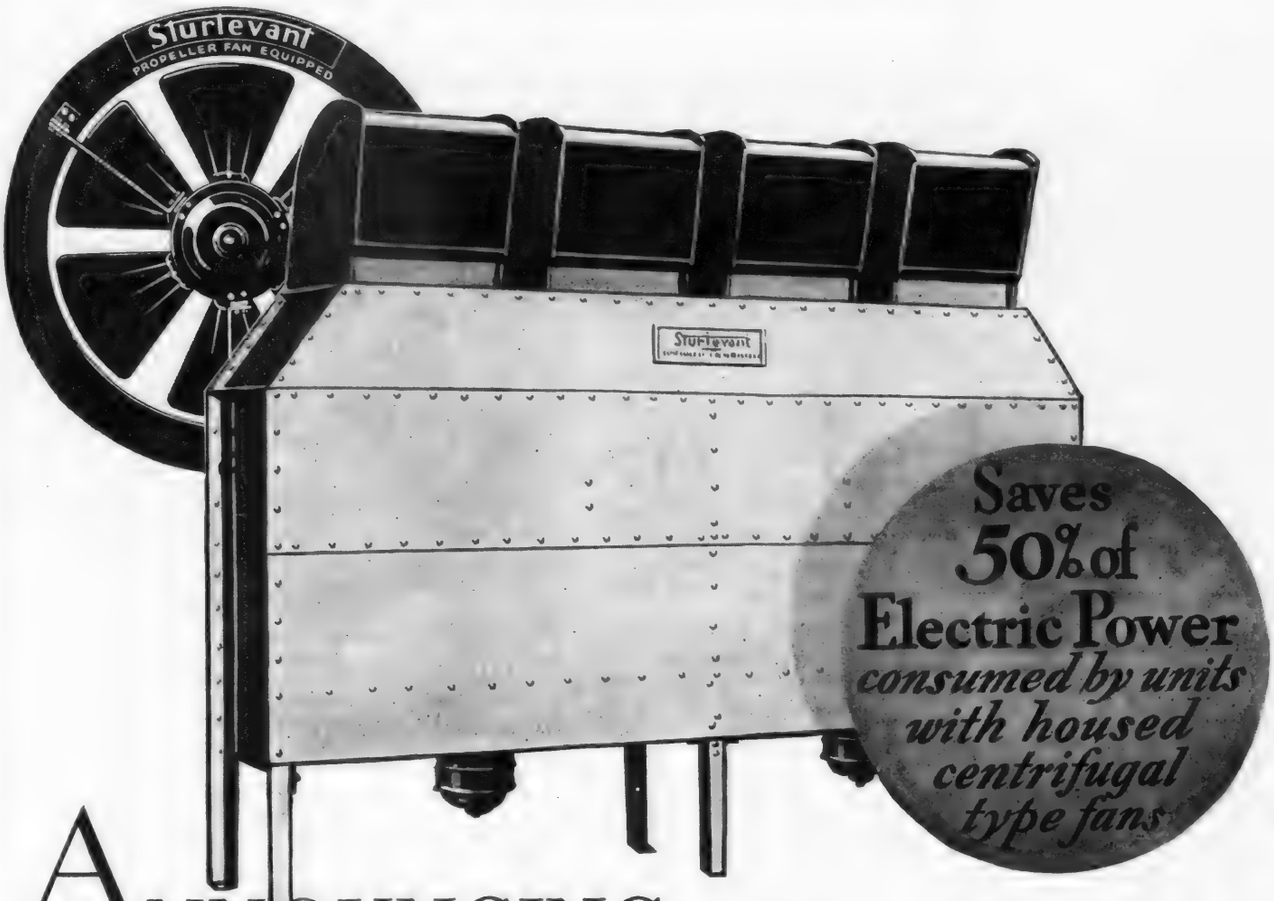
Breese Engineering Corp., Chicago, Ill., announces the formation of a separate organization, The Draft-A-Justor Corp., to handle the production and marketing of the Breese draft regulator which will be known as the Draft-A-Justor.

National Flue Cleaner Co., Inc., Groveville, N. J., has appointed the following southern representatives: Fuel Efficiency Engineering Co., American Trust Bldg., Birmingham, Ala.; A. S. Furtwangler; 4 South Broad St., Charleston, S. C.; Reed & Duecker, Inc., 171 North Main St., Memphis, Tenn.; Buckmaster-Luck-Malochee, Inc., Industrial Homestead Bldg., New Orleans, La.; Henry Eggelhof, Construction Industries Bldg., Dallas, Tex. These companies will act as exclusive distributors for the National soot blower.

Frank A. Holby Corp., 4 East 39th St., New York, announces completed arrangements with the Gulf Oil Corporation, whereby its subsidiary, the Gulf Oil Burner Co., Philadelphia, will take over the sales and manufacturing rights of Holby oil-burner equipment. Through its own organization and extensive dealer organizations the Gulf Oil Burner Company will service Holby equipment already installed, and in the future will carry on the sale of this equipment under its own name, to be known as the Gulf industrial oil-burning systems.

Apollo Metal Works, La Salle, Ill., announces that its laboratory has originated a process of manufacturing chromium plate, converted into commercial form and offered as Apollo chrome.

Kewanee Boiler Co., Kewanee, Ill., has completed plans for a $200,000 addition to its plant for the production of electric-welded boilers. Announcement also is made of the appointment of E. R. Harding as representative in North Carolina, with headquarters in the Jefferson-Standard Bldg., Greensboro.



Saves 50% of Electric Power *consumed by units with housed centrifugal type fans*

ANNOUNCING . . . .

. . . *a new floor type heater with propeller type fans!*

A worth while saving in electric power—a worth while saving in motor size and cost! Both are effected by this new development in industrial unit heating!

Propeller fans—designed and built by Sturtevant—are used in the "Tempervane" Heater. First—they're highly efficient. Second—they're *exactly* suited in performance for the low resistance offered by the Aerofin heating element. Result:—motors only half the horse-power of those used on housed centrifugal type units are required—current consumption cut 50%!

Developed in the Sturtevant Research Laboratory—the largest and most completely equipped air engineering laboratory in the world—Tempervane Heaters in design and performance meet the highest standards ever established for heating equipment, those set up by the heating and ventilating committees and societies. They have been subjected to undoubtedly the most accurate and exacting unit heater tests ever conducted. Built in both floor and overhead types, they are furnished for steam pressures up to 350 pounds per square inch.

We would welcome your request for the indisputable evidence of "Tempervane" economy—performance curves, test photographs, installations now in service. Just write our main office below.

B. F. STURTEVANT COMPANY
Hyde Park, Boston, Mass.
Branch Offices in Principal Cities

Sturtevant *Tempervane* Heater

(REG. U. S. PAT. OFF.)

Classified Advertising

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

MANUFACTURER'S AGENCY WANTED—Manufacturer of steam saving equipment and patented allied specialties, located in the East, requires agents in Virginia, North and South Carolina, and Central and Eastern Pennsylvania. This is a strictly commission project with exclusive sales rights for a qualified representative who maintains own office in each territory. Replies will be held confidential. Address Box 81, care of Heating and Ventilating Magazine.

FOR SALE CHEAP—Niagara Boiler No. 306—S-2000' and a Williams Oil-O-Matic Burner. Complete. Used one season, can be seen at Frank P. Bauer Marble Co., 4330 Melrose St., Chicago, Ill.

WANTED TO BUY—Old clogged-up hot water heaters in any quantities and of any size. Address Box 84, care of Heating and Ventilating Magazine.

ENGINEER WANTED—Position open for an experienced heating engineer with a successful piping contractor located not far from Boston, Mass. Must be capable of taking charge of several draftsmen and be willing to work on drawing-board when necessary. When writing, give age and experience. Address Box 83, care of Heating and Ventilating Magazine.

SALES REPRESENTATIVES WANTED—Old established company, manufacturing high-grade vapor heating specialties, has some territories open, particularly in the West and South. This is the easiest system to sell as it is the only true single-pipe vapor system with consequent saving in installation cost. Commission basis. Lay-outs not necessary. State territory and other lines handled. All communications held strictly confidential. Address Box 86, care of Heating and Ventilating Magazine.

WANTED—Heating and ventilating estimator and superintendent wanted by large, well-established contractors in San Francisco. Splendid opportunity for competent engineer. State age, experience and salary. Address Box 85, care of Heating and Ventilating Magazine.

MANUFACTURER'S REPRESENTATIVE—Manufacturer of complete line of fans, air washers and unit heaters, desires recognized representative on commission basis. Address Box 82, care of Heating and Ventilating Magazine.

MANUFACTURERS' AGENT — Cleveland territory, is desirous of taking on line of unit heaters and hot water storage heaters. Address Box 87, care of Heating and Ventilating Magazine.

BETTER TECHNICAL TRAINING MEANS A BETTER JOB

Warren Heckbert, of San Diego, writes us the following: "Your course has no equal. The little studying I have done has helped me to get a new and better job." St. Louis Technical Institute has successfully helped Warren Heckbert and hundreds of others in their climb to the top, and we can do the same for you if you accept our training. For 18 years, St. Louis Technical Institute has specially prepared men for promotion that was as certain as it was deserved. Our students enjoy the best of pay, steady employment, better technical knowledge. You, too, can enjoy the same success if you subscribe to St. Louis Technical Institute engineering courses. Check the subject that interests you and send for full free information without any obligation.

- ☐ Heating and Ventilating Engineering.
- ☐ Special Steam and Water Heating.
- ☐ Scientific Warm Air Heating.
- ☐ Plumbing and Sanitary Engineering.
- ☐ Contracting and Estimating.
- ☐ Mechanical Drafting.

Saint Louis Technical Institute
Est. 1910
The most thorough institution for Technical Home Study to-day.
4543 Clayton Avenue St. Louis, Mo.

Engineering Data Concerning De Bothezat Heavy Duty Pressure Fans

Important Notice: We guarantee our fans to have a **non-overloading power characteristic,** that is to absorb at constant revolutions practically **the same power** whatever the static pressure under which they are operating for the whole range between free delivery and no delivery. This important property of the De Bothezat Disc Pressure fans insures the complete safety of their operation under any conditions to be met in practice.

DE BOTHEZAT IMPELLER CO., Inc. **1922 Park Avenue, N. Y. C.**

FAN DIA.	R.P.M.	H.P.	—PERFORMANCES— CFM against ⅛" S.P.	CFM against ¼" S.P.	CFM against ⅜" S.P.	CFM against ½" S.P.	CFM against ⅝" S.P.	CFM against ¾" S.P.	CFM against 1" S.P.	CFM against 1¼" S.P.	CFM against 1½" S.P.	CFM against 1¾" S.P.	CFM against 2" S.P.
8"	1800	1/50	350										
	3400	1/6	700	650	600	550	500	400					
14"	1140	1/12	1100	900	600								
	1750	1/4	1600	1450	1300	1150	850						
18"	850	1/15	1800	900									
	1140	1/6	2500	2100	1700								
	1750	1/2	3800	3700	3500	3300	3100	2800	2000				
24"	850	1/4	4500	3800	2000								
	1140	1/2	6000	5700	5300	4900	4200	3000					
30"	600	1/3	6000	4400	2000								
	850	1	9000	8400	7600	6600	5500	3000					
	1140	2.5	12000	11500	11000	10500	10000	9500	8000	6000			
36"	480	1/2	8500	6000	2000								
	650	1	11000	10000	9000	7500	5500						
	850	2	15000	14500	14000	13000	12000	11000	8000				
	1140	5	20000	19500	19000	18500	18000	17500	17000	15500	13500	11500	8000
42"	470	1	14000	12000	9000								
	580	2	17000	15500	14000	12000	9000						
	670	3	20000	19000	18000	16500	15000	13000					
	800	5	23500	23000	22000	21000	20000	19000	16000	11000			
48"	370	1	16000	12000	7000								
	470	2	20000	18000	15000	12000							
	530	3	23000	21000	20000	18000	15000	11000					
	630	5	28000	27000	26000	24500	23000	21000	15000				

An all-year accessory at its best!

"Buffalo Breezo" is made in six sizes, from 12 to 36 inches, and two special units to meet household requirements. Its all steel, welded construction makes this fan practically unbreakable. The specially designed steel fan handles an unusually large amount of air, consuming very little power. Very quiet in operation.

Motors used were designed for this fan. Fully enclosed. Large enough to run continuously without artificial ventilation or cooling. Will operate 1500 hours without lubricating.

Sold at all leading jobbers and dealers

Good ventilation in the shop is of vital importance on these hot, sultry days. It keeps the mind of the employees alert, and on the job.

"Buffalo Breezo" gives a complete change of air every 5 to 7 minutes at a very nominal cost.

It will more than pay you to install one or more Breezo ventilating fans in your plant.

Send us a rough drawing of your shop's layout with dimensions, and our competent air engineers will gladly aid you in selecting the proper size fan and the location that will bring the best results.

Buffalo Forge Co.

480 Broadway **Buffalo, N. Y.**

In Canada
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

BUFFALO BREEZO

For Acid Fumes

No Coating
No Painting
No Maintenance

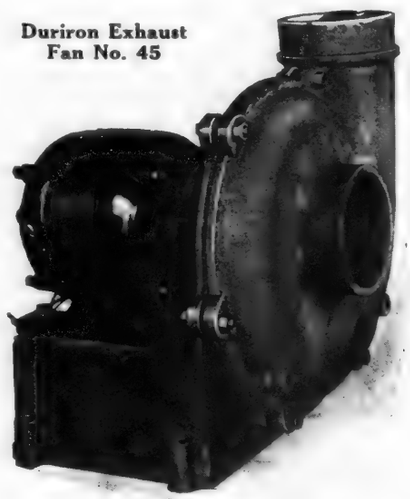
But—ALL SERVICE

And this is what we mean by fan service in handling corrosive fumes.

1. Made of a metal resistant clear through its structure to acid fumes and condensate, and thus requiring no service or attention beyond occasional oiling.
2. Operated at much higher speeds than other resistant materials; therefore a greater efficiency than other like sized units.
3. Duriron fans should last indefinitely, and function perfectly, despite the severe service encountered.
4. Thousands of installations testify to the value of Duriron acid-proof exhaust fans with all kinds of corrosive fumes.

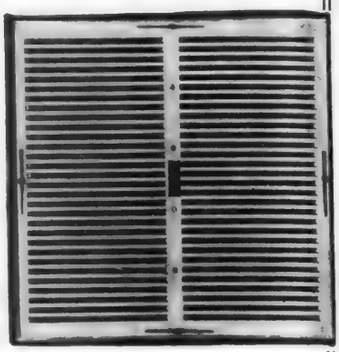
If you use or specify fans, you should have Duriron Bulletin No. 140-A. Sent on request.

Duriron Exhaust Fan No. 45



Duriron is produced only by
The DURIRON COMPANY
DAYTON·OHIO

Keep Destructive Dust and Soot out of Buildings!



According to estimate of the U. S. Weather Bureau, there are more than 100,000 particles of dust in a cubic inch of air. Dust and soot ruin costly fixtures, paintings, hangings, etc. They make frequent cleaning necessary and add hundreds of dollars yearly to cleaning bills of large public buildings.

Moreover, dust often endangers the lives of people by carrying disease germs.

PROTECTOMOTOR
REG. U.S. PAT. OFF.
Perfect Positive Protection

PANEL AIR FILTER

removes dust and soot from air and delivers clean, dry air for building ventilation. Does not add humidity or oil vapor. A test made by the University of California using a standard dust, 98.6% of which will pass through a mesh screen, gives the Protectomotor a filtration efficiency of 99-9/10%.

Protectomotor Air Filter consists of a fine texture felt filter medium formed in pockets over radial rustproof wire screen fins, mounted in heavy pressed steel or aluminum frames.

The Protectomotor Dry Panel Filter is inexpensive to install and maintain. No oil or drains or cleaning tanks required.

This Filter operates from two to six months without cleaning, depending on conditions, and it can be cleaned by our special vacuum cleaner in less than 30 seconds per panel.

Write for our interesting catalog.

STAYNEW FILTER CORP.
109 N. Water St. Rochester, N. Y.

Before you decide on the heating and ventilating, investigate the efficient and quiet performance of the ME fan, the fan of certified performance.

Write for Bulletin 100

NEW YORK BLOWER COMPANY

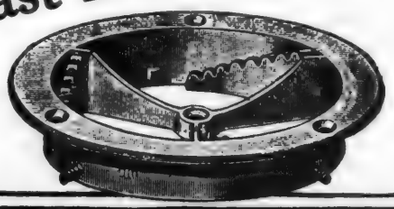
3151 Shields Avenue

Chicago, Illinois

Representatives in principal cities

in Cast Iron

The Leader is



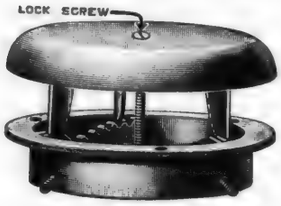
View of Bottom Casting

Nu-Notch

REG. U.S. PAT. OFF.

MUSHROOM VENTILATOR

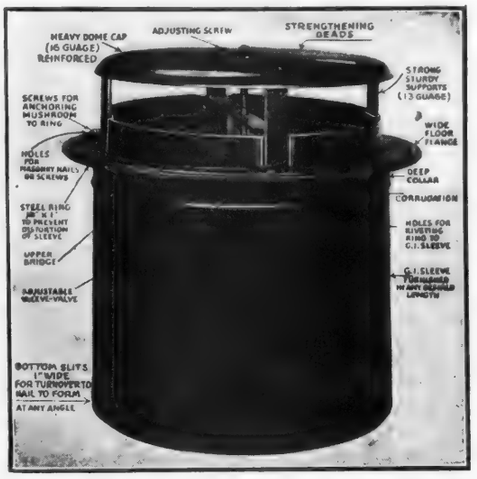
Preferred by architects and engineers because it is Simple, Rigid and easily adjusted in RECESSED NOTCHES that assure permanent adjustment. Can be used for any kind of floor. Also flat tops for low seats.



in Steel

MUSHROOM AEROVALVE AIR DIFFUSER

Made of Heavy Steel

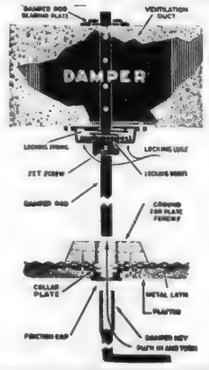

HEAVY DOME CAP (16 GUAGE) REINFORCED
ADJUSTING SCREW
STRENGTHENING BEADS
STRONG STURDY SUPPORTS (13 GUAGE)
SCREWS FOR ANCHORING MUSHROOM TO RING
WIDE FLOOR FLANGE
HOLES FOR MASONRY NAILS OR SCREWS
DEEP COLLAR
CORRUGATION
STEEL RING (16 G.) TO PREVENT DISTORTION OF SLEEVE
HOLES FOR RIVETING RING TO G.I. SLEEVE
UPPER BRIDGE
G.I. SLEEVE FURNISHED IN ANY DESIRED LENGTH
ADJUSTABLE SLEEVE-VALVE
BOTTOM SLITS 1" WIDE FOR TURNOVER TO NAIL TO FORM AT ANY ANGLE

Stronger than cast iron; will sustain many times the weight to which it is ever subjected. AEROVALVE is quickly installed, easy to regulate, and low in price. Sold with or without sleeve.

Made by the makers of the DISC-LOC Gallery Riser Vent and the TU-WAY Air Deflector

KNOWLES MUSHROOM VENTILATOR CO., 202 Franklin St., New York City

The ZENITH Self-locking DAMPER LOCK



Positively and automatically locks volume and splitter dampers in concealed ventilation ducts, in any position. No wing nuts, screws or devices loosened by vibration.

Concealed—Only one-inch plate, flush with plaster, shows.

Tamper-proof — Operated only with special socket wrench.

Economical—Inexpensive, easily installed, quickly adjusted.

A trial will demonstrate its value.

WRITE FOR LITERATURE

NORTHERN WEATHERSTRIP COMPANY

367 South First Avenue East

Duluth Minnesota

Modine

Unit HEATER

A MODINE Product

FOR STEAM-VAPOR, VACUUM, HOT WATER HEATING SYSTEMS

MANUFACTURED WEATHER

Carrier AIR CONDITIONING AND DRYING EQUIPMENT

makes

"Every day a *good* day"

Air Conditioning

Humidification, Dehumidification
Centrifugal Refrigeration
Cooling of Public and Industrial Buildings
Temperature and Humidity Control

DRYING AND PROCESSING

Carrier Engineering Corporation

Offices and Laboratories
NEWARK, NEW JERSEY

SALES OFFICES

New York Philadelphia
Boston Chicago
Cleveland
Los Angeles
Kansas City
Washington

See our detailed data in A. S. H. & V. E. Guide.

Literature on request. Write concerning your specific problem.

This is Our Idea of an Efficient Centrifugal Fan —do you agree with us?

—maximum air delivery against low or medium high resistance from a minimum of housing; construction as equally adaptable to high as to low pressures and as practicable for double as for single width fans.

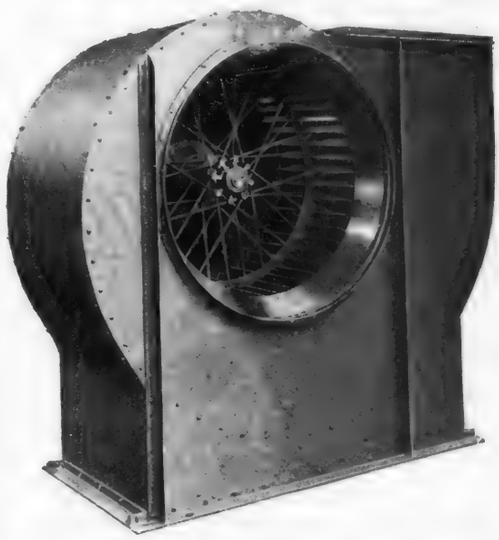
— strong, yet light, quietness in operation; mechanically of the highest obtainable efficiency.

— blast wheel of net-work or plexiform construction to provide maximum strength from the minimum of material weight.

—large and unobstructed inlets and outlets; small housings.

—blast wheel construction on a balanced center and built up with parts of uniform weight and gauge, thus making the blast wheel, when assembled, in balance.

The Plexiform Fan—light, easy running, low operating cost. Made in various sizes and types for engine, motor or line shaft drive.



That briefly is the Bayley concept of an efficient centrifugal fan and the manner in which the Bayley Plexiform Fan is built. Scores of installations have proven it successful. May we tell you where they are and state the argument more fully by means of our Bulletin No. 26.

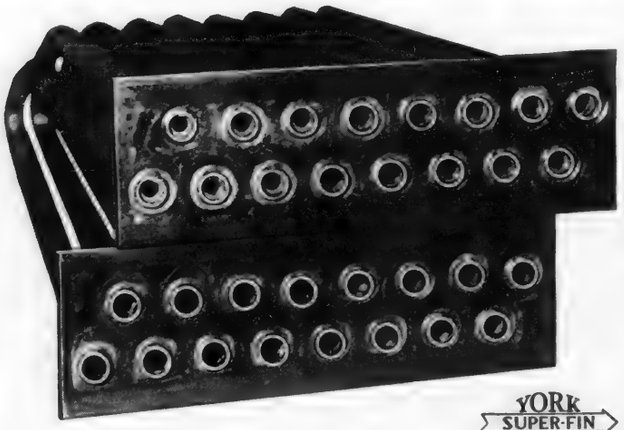
BAYLEY BLOWER COMPANY

742 Greenbush Street Milwaukee, Wis.

Bayley

AIR ENGINEERING & EQUIPMENT

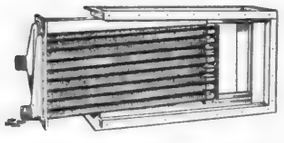
HEATING AND VENTILATING
AIR WASHING AND HUMIDIFYING SYSTEMS
MILL EXHAUSTERS—PRESSURE BLOWERS
MECHANICAL DRAFT FANS
AIR AND GAS SCRUBBERS
INDUSTRIAL DRYING SYSTEMS



FUSED

THE TUBES of York Super-Fin Units are *fused to the headers.* Every joint becomes an integral part of both header and tube, durable as the metal itself; capable of withstanding indefinitely the destructive temperature of high-pressure steams.

York U-tube construction eliminates expansion and contraction strains, prevents leaks and increases the length of service of every Unit. As an assurance of super-abundant strength, every Super-Fin Unit is tested at 1000 pounds hydrostatic pressure and guaranteed for 200 pounds operating pressure. York Heating & Ventilating Corporation, 1539 Sansom Street, Phila.



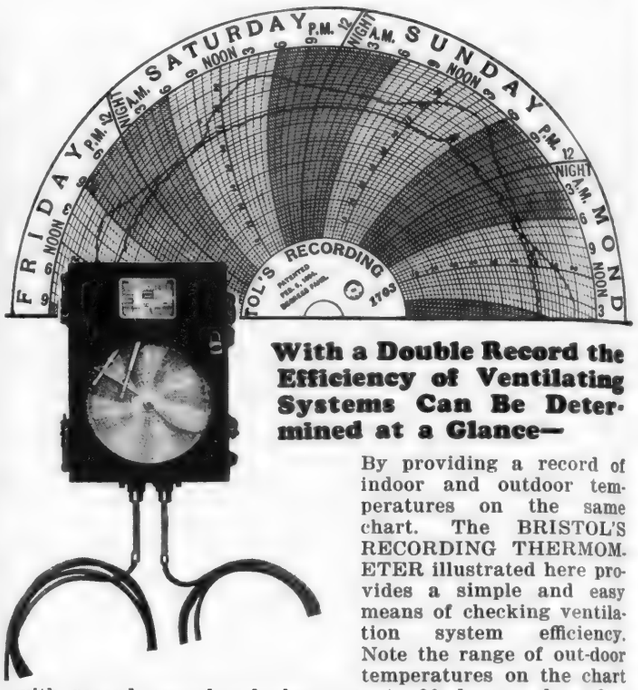
Removable Coils

By no more effort than loosening a few bolts, the coils in an encased York Super-Fin Unit can be entirely removed from the casing. Simplifies removal for cleaning, especially when coils are in stacks.

YORK HEATING & VENTILATING CORP'N
PHILADELPHIA

Engineered Products

YORK SUPER-FIN



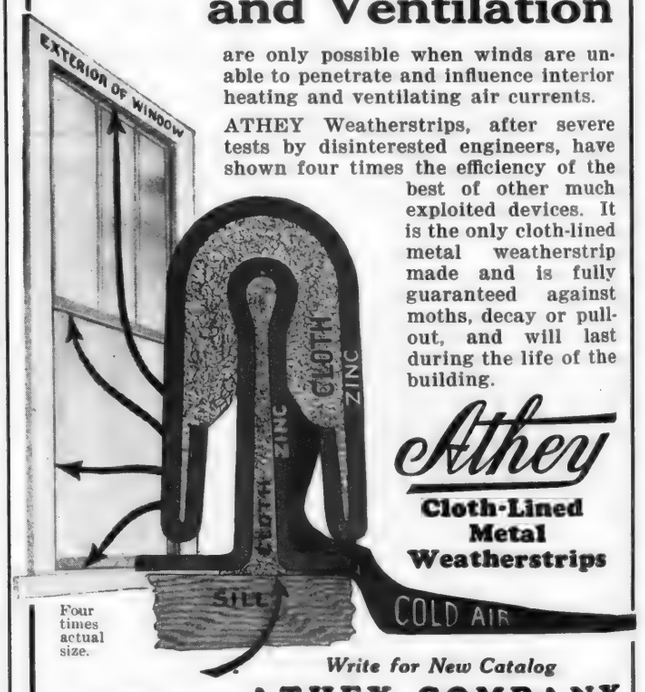
With a Double Record the Efficiency of Ventilating Systems Can Be Determined at a Glance—

By providing a record of indoor and outdoor temperatures on the same chart. The BRISTOL'S RECORDING THERMOMETER illustrated here provides a simple and easy means of checking ventilation system efficiency. Note the range of out-door temperatures on the chart with record reproduced above—up to 90 degrees day after day, while the temperature indoors remains about 68 degrees. Such records, always at hand for comparison at a glance, permit the immediate detection of undesirable conditions, and their correction before serious inconvenience arises. Simply and ruggedly constructed, with no complicated parts to get out of order, Bristol's Recording Thermometers will operate accurately for years with a minimum of care and adjustment.

Write for Complete Installation Details

THE BRISTOL COMPANY, Waterbury, Conn.

Controlled Heat and Ventilation



Four times actual size.

are only possible when winds are unable to penetrate and influence interior heating and ventilating air currents.

ATHEY Weatherstrips, after severe tests by disinterested engineers, have shown four times the efficiency of the best of other much exploited devices. It is the only cloth-lined metal weatherstrip made and is fully guaranteed against moths, decay or pull-out, and will last during the life of the building.

Athey

Cloth-Lined Metal Weatherstrips

The best Heating Engineers plan for sufficient heat with a minimum fuel consumption by Atheyizing all windows of wood or steel.

Write for New Catalog

ATHEY COMPANY

6087 W. 65th St. CHICAGO

Representatives in Principal Cities and in Canada

Summer Preparedness for Winter Heating!

Without interfering with production

These views show the efficient action of Wing Heaters in spreading warm air about the working level, without perceptible air movements. The upper picture shows two Wing units in a furniture factory; and the bottom picture is a garage heated by two low ceiling type Wing Unit Heaters.

Wing Featherweight Unit Heaters

HEAT with Unit Heaters

The Wing Heating System can be installed in any shop, garage or industrial building without interruption to factory production and without interference in any way with machines, men or management.

This is due to the overhead position of Wing Featherweight Unit Heaters. Entirely out of the way. Every square foot of floor space saved for manufacturing purposes. No moving of equipment or re-arranging of floor plan.

Wing Featherweight Unit Heaters are easily installed in their overhead location because they are light in weight and compact. Only a minimum of piping and fittings are required; straight line runs and connections in the open aid installation.

Of course, no pipe trenches or sub-grade boiler rooms are necessary; nor any building alterations.

Heat is Saved

Wing Featherweight Unit Heaters operate on the principle of withdrawing air from the upper spaces and delivering it, heated, to the working floor—where it is wanted. They thus prevent valuable heat from accumulating at a point where it serves no useful purpose. This means that heat is saved and less fuel is required to heat the building.

Write for Wing Heater Bulletin

L.J.Wing Mfg.Co.

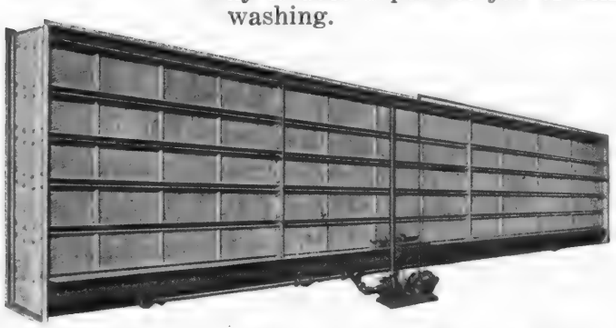
158 West 14th Street, New York City

Just Published!—*the inside story of the* G.A.F. *Automatic, Self-Cleaning Air Filter*

Every Architect, Heating and Ventilating Engineer, Contractor and Business Executive should have a copy.

IT TELLS:

How the Filter cleans the air.
Why it cleans it with maximum efficiency.
How the Filter cleans itself.
Why it does a perfect job of self-washing.



The G. A. F. Automatic, Self-Cleaning Air Filter—Typical large unit.
Normal Capacity 90,000 CFM.
Completely eliminates human element from filter operation.

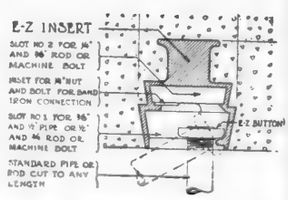
How the Filter rids itself of the sediment.
Why it ejects all of the sediment.
In short, how and why the Filter *completely eliminates the human element* from filter operation.
It makes clear the remarkably simple and sturdy construction, easy erection and many other advantages.
It gives tables of sizes and capacities and other data necessary to the selection of the proper filter for any application.

To any Architect, Engineer, Contractor or Business Executive requesting it on his business letterhead, a copy will be gladly sent. Write for your copy today.

General Air Filters Corp.
Division The W. B. Connor Co. Inc.
369A Lexington Ave., New York
Manufacturers of Air Cleaning and Conditioning Equipment, Air Filters, Air Washers, Spray Nozzles

E Six in One Z
Concrete Inserts

One Size for All Pipe Hangers


E-Z INSERT
SLOT NO 2 FOR ⅜" AND ½" ROD OR MACHINE BOLT
INSET FOR ⅜" NUT AND BOLT FOR BAND IRON CONNECTION
SLOT NO 1 FOR ½" AND ¾" PIPE OR ½" AND ⅜" ROD OR MACHINE BOLT
STANDARD PIPE OR ROD CUT TO ANY LENGTH
E-Z BUTTON

ONLY one size needed for all pipe hangers. Ball and socket connection between insert and hanger. Fully adjustable — allows play to overcome expansion and inaccurate alignment of inserts. *E-Z Button turns in the insert—no couplings or turn-buckles needed.* Write for details and prices.

E-Z Radiator Hangers for All Tube Type Radiators

They enable use of *legless* radiators for easier floor cleaning, furnishing or carpeting. No radiator legs to interfere with mop or sweeper.

Write for Typical Specifications

HEALY-RUFF CO.
772 Hampden Ave. St. Paul, Minn.

For Heating and Ventilating Use

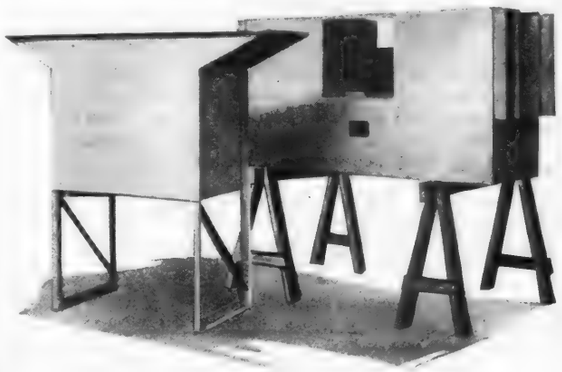
Propeller Type Exhaust Fans

Big air removal capacity. Sturdy spot welded supporting ring. Powered with Emerson fully enclosed motor, specially designed for this work. Long life and quiet, vibrationless operation assured through use of finest materials and workmanship. Sizes 12-16-18-24-30-36 inches.

THE EMERSON ELECTRIC MFG. CO.
2018 Washington Ave., St. Louis, Mo.
806 W. Washington Blvd., Chicago, Ill.
50 Church St., New York City.

EMERSON MOTORS *and* **FANS**

NOW Shipped Completely Assembled



TWINFAN
UNIT HEATERS

TWINFAN Unit Heaters are now shipped assembled in just two units. All that is necessary for installation is to place one unit on top of the other and bolt together. Steam connections have been greatly simplified. There is only one steam supply and only one return connection required, except in the large Heaters Nos. 77 and 102, which require two connections.

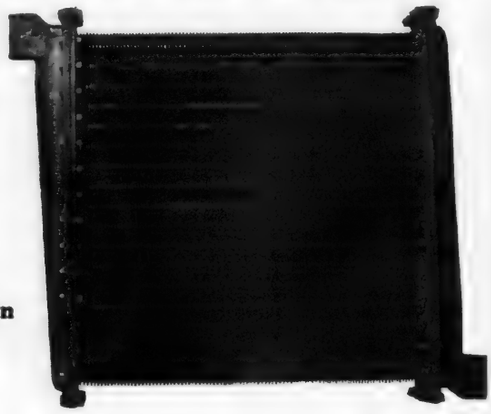
A more detailed story of the improvements and refinements made in this new TWINFAN Heater is found in our Bulletins Nos. 201 and 202, which we will be pleased to send on request.

At right is shown a Twinfan Unit Heater suspended from a brick wall. It rests on an angle iron and the top corners are supported by strap hangers. All supports are bolted to the unit and attached to the wall by lag screws.

DWYER EQUIPMENT CO.
4534 W. NORTH AVE. CHICAGO, ILL.

HEAT WITH **WINFAN** UNIT HEATERS

HELICALFIN



Seamless Copper Construction

EXTENDED SURFACE RADIATION

Meets the Demands of Modern Heating and Ventilating Progress

For Permanence and High Efficiency Specify

Rome Helicalfin Tubing

Helicalfin Heater Units and Radiators offer great advantages in high efficiency. The cores consist of tubes and headers made of copper and brass. They are sturdy, compact, light in weight, and last indefinitely with practically no corrosion.

Helicalfin Heater Units and Radiators are the ideal heating equipment for Homes, Schools, Institutions and Industrial Plants.

Rome Helicalfin Radiation has from five to nine times radiating surface of plain tube with proportionate increase in efficiency.

Engineering data covering the performance of Rome HELICALFIN Heaters has been prepared by a nationally known test engineer and is available upon request.

Makers of Good Radiators since 1905

ROME-TURNEY RADIATOR COMPANY
ROME, N. Y.

TYPHOON

Multiblade Disc Blower

Disc Blowers
Centrifugal Blowers
Belt-driven Direct-connected
Unit Drive Fans
Unit Heaters
Ventilating Systems
Air Conditioning Systems

Typhoon Products and Typhoon Systems have been installed all over the country and all over the world. Typhoon is an international standard of efficiency for cooling, heating, and ventilating systems.

TYPHOON FAN COMPANY
345 West 39th Street
New York City
Dealers' and engineers' inquiries invited

TURTLEBACK
TRADE MARK

Even Distribution of Fresh Air

To insure the health and comfort of an audience in a theatre or auditorium, fresh air must be supplied evenly and constantly in all parts.

Turtlebacks meet the requirements of the architects and engineers wherever a uniformly diffused air supply at the floor line is desired. Easily installed, simply adjusted, and rigid when locked in place by the center set screw. Made of cast-iron, is unusually strong and is economical because it requires no replacements.

Write for illustrated catalog

VENTILATING PRODUCTS CO.
2800 Cottage Grove Ave., Chicago, Ill.

There's where you want heat ..... the work area .....

Skinner Brothers "work-area" heating in the plant of C. O. Bartlett and Snow, Cleveland

To keep heat in the "*work-area*"

keep the heating unit on the floor

If you are planning a new building of any kind or if your present heating system is obsolete [which means it's also inadequate and costly] Skinner sales-engineers can show you the way to solve the heating problem "for good". Write them.

You will find a representative in each principal city. See phone book for branch in Washington, Kansas City, Cleveland, Pittsburgh, Buffalo, Detroit, Seattle, Baltimore, Chicago, Boston, Philadelphia, Cincinnati.

Factories at St. Louis and Elizabeth, N. J.

H7

Heated air naturally rises unless forced to do otherwise.

Therefore, if warm air is to be kept down where your producers are working, your heating system must include some means of drawing the cooler air stratum from the floor level.

Skinner Brothers (Baetz Patent) Unit Heaters are designed to take advantage of a few simple principles to keep heat down in the *work-area*. A fan in the heater passes air over the heating unit, blows it out just above the heads of the workers and carries it to the farthest corner of the room. Even then this layer of heated air would rise if no controlling force was applied. There must be some action to keep the warm air down.

As the intake openings of the Skinner Unit are at the floor level the lower layer of cooler air is constantly being pulled off the floor. Natural physical laws cause the warm air from above to settle down and replace the air that is removed. Thus there is a great warming blanket of air constantly diffused throughout the entire *work-area*.

Just consider a heating method based upon such simple principles and adapted to your needs by heating experts with a 34-year accumulation of heating experiences to guide them. Such is the combination offered by Skinner Brothers.

Skinner Brothers *work-area* Heating

1470 S. Vandeventer, St. Louis—N. Y. Office, 1710 Flatiron Bldg.

Originators of the Unit Method of *work-area* Heating

"TENTACULAR"

Higher Efficiency in Power Transmission

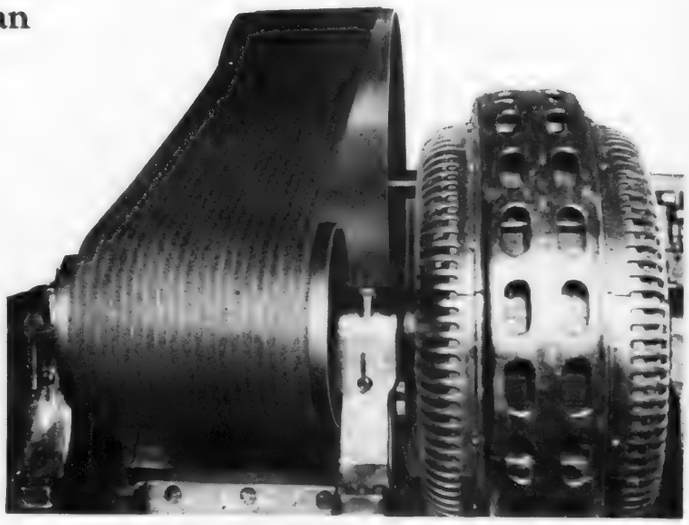
"TENTACULAR" on 400 H. P. Fan

Engineers, realizing what efficiency in power transmission means, specify "TENTACULAR."

A "TENTACULAR" installation is cheaper and much more practical than other systems of power transmission of the same class.

A "TENTACULAR" drive consists of two regular cast iron or steel pulleys, one "TENTACULAR" belt made to any length. That's all.

For ventilating work specify "TENTACULAR" noiseless belts.



Let our Engineering Department help you. Send for "TENTACULAR" New Engineering Manual.

ALEXANDER PHILADELPHIA

Alexander Brothers, Inc., 19 South Street, PHILADELPHIA, PA.

Sole Makers of Tentacular Transmission Belting

Branches and Distributors in All Principal Cities

Lakeside

VENTILATING IXL SYSTEM

Quiet *Electric Ventilator*

An electric ventilator that fills a long felt need—efficient and quiet in operation.

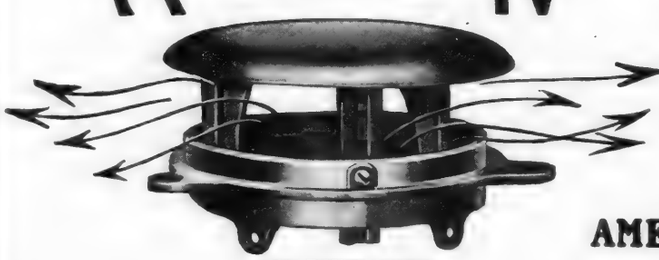
Easy to install—requires no tearing down of walls or ripping of floors.

Write for catalog.

LAKESIDE COMPANY, 107 Main St., Hermansville, Mich.

SPRACO AIR FILTERS

KAUFFMAN



AIR DIFFUSERS

SINCE 1908

Kauffman Air Diffusers

HAVE BEEN IN USE IN

Some of America's Finest Theatres

Simple to Install—Low in Price

Graduated Air Control

AMERICAN METAL PRODUCTS CORP.

ST. LOUIS, U. S. A.

No motor made

was quiet enough for the *"Silent"* Unit Ventilator . . . so Sturtevant built the Super-Silent Motor

A DIFFICULT task lay before the Sturtevant engineers who set out to build a really *silent* unit ventilator.

Not only did they have to design new fans that would move air noiselessly, but a new motor also had to be built. No motor made was quiet enough without the aid of troublesome spring suspension.

In the famous Sturtevant Research Laboratories—with every mechanical aid at hand to assist engineering skill, the work was begun. Designs were made and remade. Models were built and torn apart. Finally a motor was perfected—the first motor built quiet enough for silent unit ventilation, free from magnetic hum, without spring suspension. A motor that requires but one oiling per year—with phosphor bronze bearings, guaranteed not to wear "noisy."

This Sturtevant Super-Silent Motor and the new noiseless fans made possible the *Silent* Sturtevant Unit Ventilator. Silent operation, speed regulators and attractive metal cabinet work make it the ideal ventilator for school, church and office—any place where disturbing operating noise cannot be tolerated.

Arrange with the nearest Sturtevant office for a demonstration—test the outstanding quietness of the *"Silent"* Sturtevant.

B. F. STURTEVANT COMPANY, HYDE PARK, BOSTON, MASS.

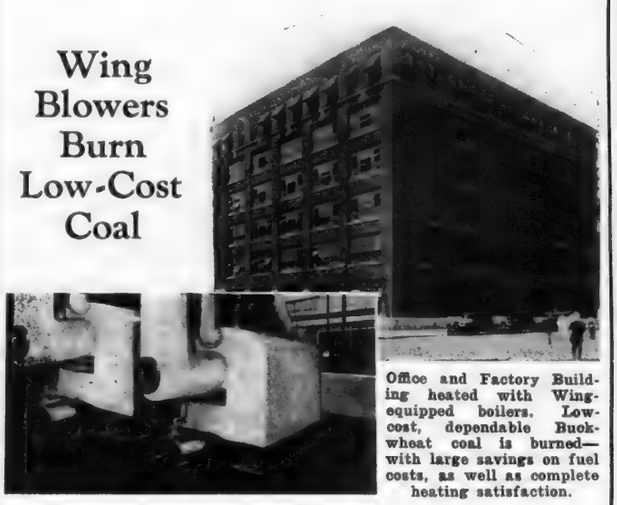
Atlanta	Camden	Cleveland	Detroit	Los Angeles	New York	St. Louis
Birmingham	Charlotte	Dallas	Hartford	Minneapolis	Pittsburgh	San Francisco
Boston	Chicago	Denver	Indianapolis	Milwaukee	Portland	Seattle
Buffalo	Cincinnati		Kansas City		Rochester	Washington, D. C

Canadian Offices at: Toronto, Montreal and Galt, Ont. Also Agents in Principal Foreign Countries

Sturtevant REG. U.S. PAT. OFF. *the Silent Unit Ventilator*

How to Save Money *for* Owners!

Wing Blowers Burn Low-Cost Coal



Office and Factory Building heated with Wing-equipped boilers. Low-cost, dependable Buckwheat coal is burned—with large savings on fuel costs, as well as complete heating satisfaction.

OWNERS want their heating plants to give dependable and quiet heating *at low cost.* Wide-awake owners are getting this kind of efficient heating by burning Buckwheat coal.

Wing Motor Blowers supply the necessary forced draft to burn completely every particle of this economical and dependable coal. Buckwheat contains as many heat units per pound as Stove or Egg. It is simply smaller in size—*and costs only* $7 *to* $8 *a ton!* And no more tonnage is required.

You can make good money by selling and installing Wing Blowers. It is simple and easy work. Let us tell you how. Write for more information. The coupon below is for your convenience.

L. J. Wing Mfg. Co.

158 West 14th St., New York, N. Y.

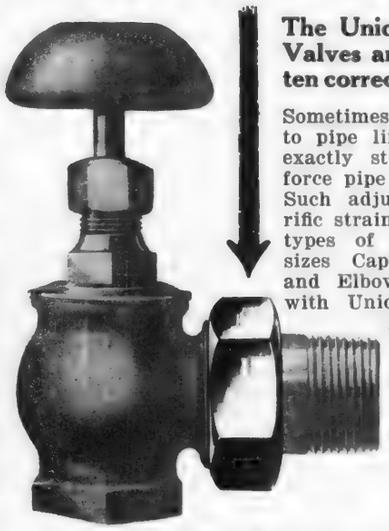
L. J. WING MFG. CO., 158 W. 14th St., New York, N. Y.
Please send, without obligation, the Wing Motor Blower Bulletin, and full details on how I can make money by installing Wing Blowers.

Name .....

Address .....

.....

—and Now Union Nuts of FORGED BRASS!



The Union Nut of Radiator Valves and Elbows must often correct installation errors.

Sometimes to pull radiator closer to pipe line or if riser is not exactly straight the nut must force pipe to proper connection. Such adjustments cause a terrific strain—and this is why all types of the principally used sizes Capitol Radiator Valves and Elbows are now equipped with Union Nuts of FORGED BRASS.

FORGED BRASS NUTS

—twice the strength of ordinary cast brass nuts.

Capitol Steam Union Radiator Valve No. 41, shown above, is equipped with FORGED BRASS union nut.

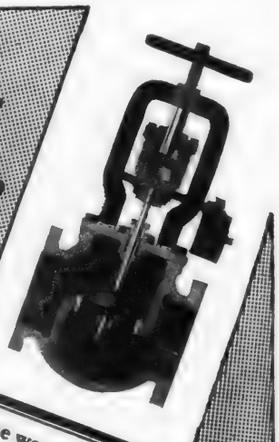
CAPITOL BRASS WORKS

Division of Michigan Smelting and Refining Co.

MANUFACTURERS OF BRASS VALVES, BOILER TRIMMINGS AND PLUMBERS' BRASS GOODS

DETROIT, MICH.

Steam can't back up through this valve



YOU are certain of a one way steam flow when Davis Stop and Check Valves protect the boilers. The serious accidents so frequently caused by a reverse steam flow when one of the boilers on the line lets down are positively prevented by this Automatic Davis Valve. Absolutely reliable in operation, it permits steam to flow from the boiler to the header, but closes instantly should the flow be reversed. The action is visible and may be hand tested quickly and conveniently.

It is simplicity of construction and design that has won Davis Valve Specialties a reputation for dependable service. Get the details in the Catalog.

G. M. DAVIS REGULATOR CO.

436 Milwaukee Avenue, Chicago, Illinois

H&V8-Gray

Be Guided by Experience

in choosing heating and ventilating units

The Peerless Unit Ventilation Company was the pioneer manufacturer of heating and ventilating units. Purchasers of PeerVent Units are not experimenting with something new. Units built by this company fifteen or more years ago are still in service and giving perfect satisfaction.

The present-day PeerVent Unit is greatly improved with a remarkable and fundamentally right radiator, silent motor, improved methods of control, and other exclusive features.

Write for Booklet on the Unit System of Heating and Ventilating; or, on request, we will send our local representative.

PEERLESS UNIT VENTILATION COMPANY, INC.
BRIDGEPORT, CONNECTICUT

Selling Agents in Principal Cities from Coast to Coast

PEERVENT

HEATING AND VENTILATING UNITS

Remember! Armstrong traps for those unit heaters

DON'T overlook that problem of drain ng unit heaters. Condensate and air unless completely removed will decrease the capacity and efficiency of the heater units, and will cause a lot of trouble and grief. You can avoid all of this by installing Armstrong Traps under the unit heaters, and assure yourself of a successful job.

Armstrong Traps keep unit heaters at their maximum efficiency. They drain all the condensate regardless of temperatures. No air valve is needed with the Armstrong.

Accumulated air and gases are discharged with the condensate. They are water sealed at all times against the leakage of live steam. Armstrong traps have a large capacity for their small size. Heat treated chrome steel valves and sturdy construction of all parts give trouble-free operation for a period of years.

There are thousands of Armstrong Traps in use in hundreds of industries. If you don't know how good they are, ask the first user you meet—then on your next job remember—Armstrong Traps for those unit heaters.

Armstrong Machine Works
346 Maple St., Three Rivers, Michigan
District Representatives in 36 Cities

ARMSTRONG "INVERTED BUCKET" STEAM TRAP

H & V 8-Gray

For buildings hard to heat

For the economical distribution of heat in
Factories
Railroad Shops
Roundhouses
Warehouses
Mills
Garages
Gymnasiums
and all industrial buildings, as well as in special process rooms where uniform heat maintenance is required.

ANOTHER building hard to heat . . . yet "*Our entire building was comfortably heated, due to the effectiveness of the Herman Nelson Unit Heaters,*" says the F. Wesel Manufacturing Company.

The Herman Nelson hiJet Unit Heater has reversed the process in industrial heating—by directing the jet of warm air at high velocity *to the floor line*. As this air strikes the floor line, it dissipates the cold air strata, and causes a thorough diffusion of the warmed and cold air—resulting in a uniform temperature.

This operating principle, long recognized as the ideal, has been realized in the development of the hiJet Unit Heater—and in the construction of the Herman Nelson Wedge Core Radiator as the heating element. A steamway or core, it is leak-proof, non-corrosive, *virtually indestructible*, and offers little resistance to air flow.

With thousands of successful installations to its credit, and with universal endorsement by Plant and Business Executives, the hiJet opens up a remarkable sales and profit opportunity for Heating and Ventilating Engineers and Contractors. Send coupon now for full information.

This radiator makes the difference

The Wedge Core RADIATOR

F. Wesel Manufacturing Company, Scranton, Pa.

The HERMAN NELSON hiJet TRADE MARK UNIT HEATER

Manufactured only by THE HERMAN NELSON CORPORATION, *Moline, Ill.*
Builders of Successful Heating and Ventilating Equipment for Over 20 Years

Sales and Service

BELFAST, ME.	SAGINAW	GREEN BAY	DENVER
BOSTON	DETROIT	MINNEAPOLIS	SALT LAKE CITY
NEW YORK CITY	CLEVELAND	ST. LOUIS	SPOKANE
UTICA	COLUMBUS	BIRMINGHAM	PORTLAND
BUFFALO	CINCINNATI	ATLANTA	SAN FRANCISCO
PHILADELPHIA	TOLEDO	MEMPHIS	SEATTLE
SCRANTON	INDIANAPOLIS	EMPORIA	VANCOUVER
PITTSBURGH	CHICAGO	DALLAS	TORONTO
CHARLOTTE, N. C.	DES MOINES	KANSAS CITY	WINNIPEG, MAN.
GRAND RAPIDS	MILWAUKEE	OMAHA	CALGARY, ALTA.

GET FREE BOOK

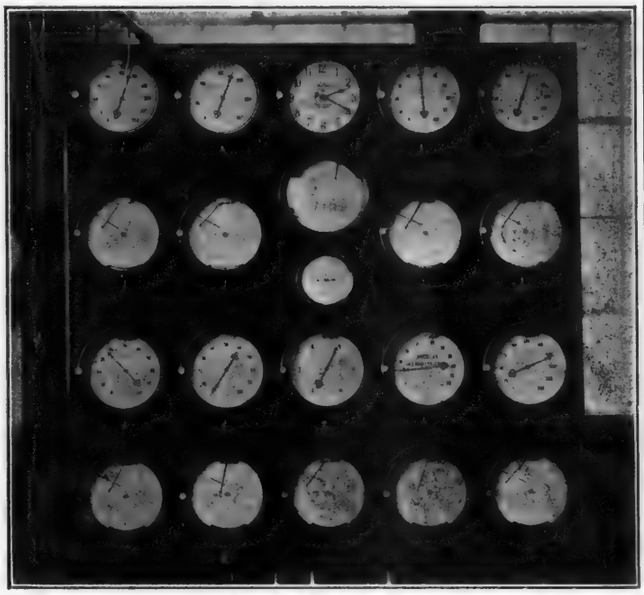
THE HERMAN NELSON CORPORATION
Moline, Illinois

Gentlemen:
Please send me book No. 12 containing the facts about the Herman Nelson hiJet Unit Heater.

Name..... *Firm Name*.....

Address..... *Type of Building*.....

GAUGE BOARDS



When accuracy and close control over operating conditions are necessary, American Gauges are selected as a matter of course.

American Gauges, Recording Gauges, Dial Thermometers, Recording Thermometers and Clocks are furnished in the same case for uniformity of appearance, either for wall or flush mounting. They make ideal gauge board installations.

Write for the following Catalogs:

Gauge Catalog A-14,
Recording Gauge Catalog E-14,
Gauge Tester Catalog D-14,
Relief and Pop Valve Catalog V-14,
Thermometer Catalog F-14,
Dial Thermometer Catalog G-14,
Recording Thermometer Catalog H-14,
Temperature Controller Catalog R-14.

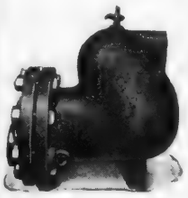
AMERICAN INSTRUMENTS

American Schaeffer & Budenberg Corporation

338 Berry St., Brooklyn, N. Y.
Branches in Principal Cities
Makers of American Industrial Instruments since 1851.

THE VALVE

Simple in construction, yet highly efficient in operation.



THE STEAM TRAP

Made in capacities up to 75,000 lbs. per hour.

A Sturdy Trouble-proof Steam Trap

No complicated parts to get out of order in the Paracoil Steam Trap! This trouble-proof trap is so sure in its operation that it is *guaranteed against repairs* for two years.

The only moving part, the recessed aluminum bronze valve ball does not lift, but rotates over the port, thus assuring long life and a constant flow of condensate.

Paracoil Steam Traps are used and endorsed by many of the largest and most discriminating concerns. Write for catalog and specifications.

DAVIS ENGINEERING CORP.
90 West St., New York City
Factory: Elizabeth, N. J.

Paracoil Steam Trap

CONTROL THE SPEED OF YOUR VENTILATING EQUIPMENT!

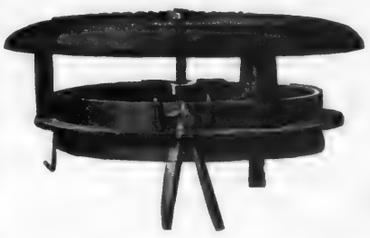
REGULATE WARM AND COLD AIR VOLUME

WITH THE TIME TESTED

HORTON VARIABLE SPEED PULLEY

HORTON MANUFACTURING COMPANY
3008-3016 University Avenue S.E. Minneapolis, Minn.

MINNEAPOLIS REFERENCES
Morgan-Gerrish Co. Richardson-Boynton Co. Thomas Cook Co.
American Foundry & Furnace Co. St. Paul



E-Z DAMPER GRIP-TITE Floor Vents

POSITIVE AIR CONTROL AT FLOOR LEVEL

ÆOLUS DICKINSON

3336-44 So. Artesian Ave. **CHICAGO**

(Some territory open for agents)

Quicker— more Efficient Heating for

Factories, Offices, Stores

In the office and factory of the Lamberson Japanning Co., McQuay Unit Heaters have proved their superiority over other means of heating. Read their letter.

Quick, efficient heating depends on circulation. McQuay Unit Heaters direct the heated air down towards the floor—where it is needed—*and distribute it evenly throughout.*

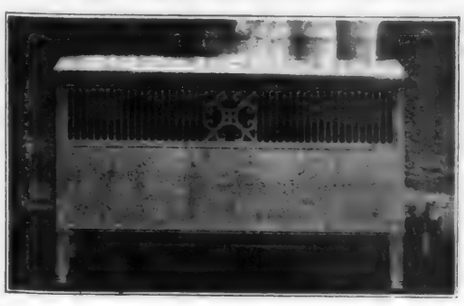
In construction the patented "lock seam" tubing completely overcomes the leakage hazard. The tubes are heavy brass, tinned inside and out, immune from rust and corrosion. Header plates are of copper, tanks cast of special bronze alloy. The entire heater is practically indestructible. A quarter inch band of cork, between the motor and the steel band supporting it, *makes its operation entirely noiseless.*

McQUAY *Unit* HEATERS

Built in sizes equivalent to 50 to 650 sq. ft. of radiation, McQuay Unit Heaters are ideal for offices, stores, factories—anywhere where people gather.

Also Cabinet and Concealed Radiators

A complete radiator, not just a cabinet, enclosed in a beautiful cabinet of heavy furniture steel which can be decorated in harmony with the room it heats. Does away with streaked walls—by sending the heated air out into the room where it is needed, instead of up against walls and drapes.



The heating unit—a distinctive McQuay development—consists of a series of flat, horizontal tubes, securely held in place by copper fins and firmly nested in bronze headers. It is immune from rust and corrosion, will not clog, and is practically indestructible. Heats quicker and more efficiently.

"Any Finish on Anything"

Lamberson Japanning Company

Established 37 Years WM. J. MICHELLA, President

1162-66 West Twenty-Second St.

Telephone all Departments
Canal 1866—Two Trunk Lines

CHICAGO

May 8, 1928.

McQuay Radiator Corporation,
Chicago, Ills.

Gentlemen;

We have had part of our factory and offices heated with McQuay Unit Heaters during the past season. They have given utmost satisfaction and are far superior to the old style direct radiation.

We find them practically noiseless in operation and give an excellent distribution of heat, so that our whole factory is kept at an even temperature at all times.

We also notice that we can heat our building much quicker on cold winter mornings than would be possible with old style radiators. Two of our front offices are heated with your small polished aluminum unit heaters and they are so quiet in operation that it is hard to tell whether they are turned off or on. They make an ideal office radiator as they keep the air in circulation as long as they are turned on.

Very truly yours

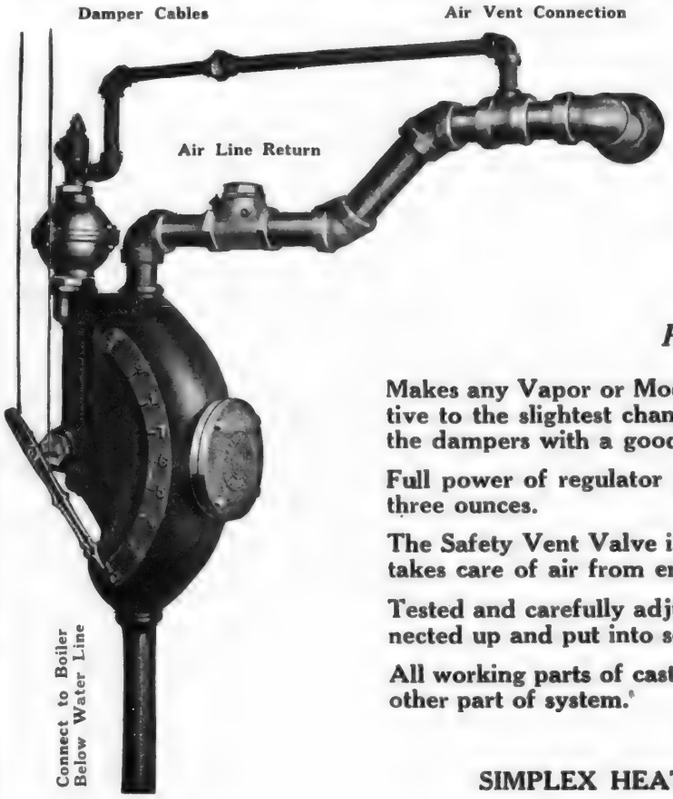
LAMBERSON JAPANNING COMPANY

A H Zach

AHZ/B

McQUAY RADIATOR CORPORATION

General Sales Office: Pure Oil Building, Chicago
Eastern Branch: 2148 Graybar Bldg., New York City



Wiley

Safety-Vent Vapor Regulator

POWER IS ITS MIDDLE NAME

Makes any Vapor or Modulating System safe and satisfactory. Sensitive to the slightest change in pressure. Has ample power to control the dampers with a good working margin.

Full power of regulator is exerted within a pressure range of two or three ounces.

The Safety Vent Valve is a distinguishing feature of this regulator and takes care of air from entire heating system.

Tested and carefully adjusted before leaving factory, ready to be connected up and put into service, with the least trouble and expense.

All working parts of cast bronze. Will last as long as the boiler, or any other part of system.

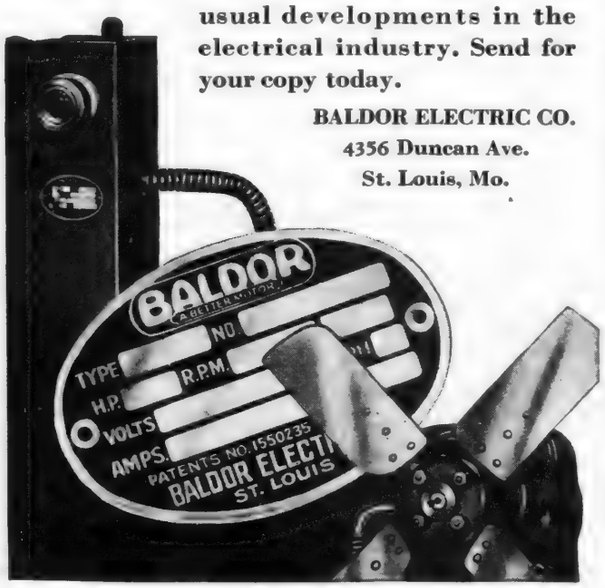
Write for details

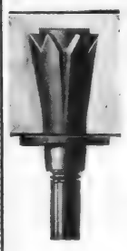
SIMPLEX HEATING SPECIALTY COMPANY, Inc.
LYNCHBURG, VA.

CONTROLLED
Ventilation or Radiation

A turn of a switch will give ½, ¾ or full speed when a fan or blower is equipped with a Baldor Type C Condenser Motor and Controller. Send for complete details. Bulletin No. 11 contains complete information about this and other unusual developments in the electrical industry. Send for your copy today.

BALDOR ELECTRIC CO.
4356 Duncan Ave.
St. Louis, Mo.





Phillips Self-Drilling Expansion Shells

Make their own hole and stay tight permanently. Quick, economical and reliable Shells are sharp and tough, and easy to install. Have U. S. Standard threads for rods, bolts and screws. Installed by hand or with Phillips Spring Hammer. No drills required.

Write for full details

Phillips Drill Company
1537 Cortland St., Chicago

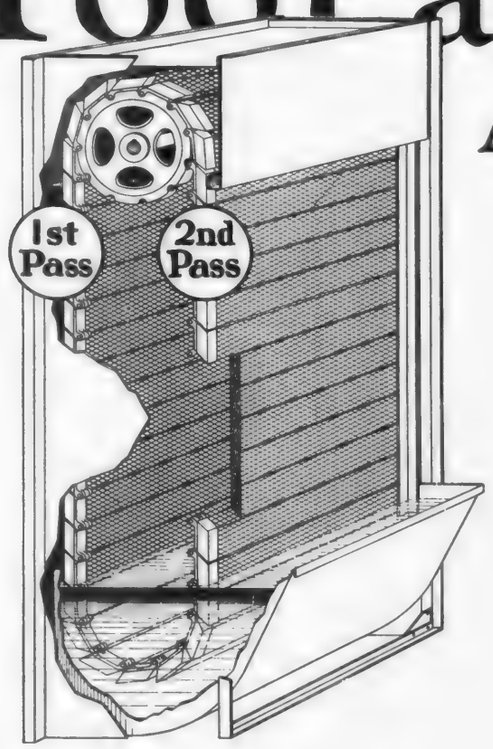
CENTRAL STATION STEAM CO.
2912 East Woodbridge St.
DETROIT, MICHIGAN

MANUFACTURERS OF

Cadillac Condensation Meters
Detroit Feed Water Meters

Packingless Expansion Joints and other special fittings for underground steam distribution mains.

The TooPas Air Filter



Time tested in principle

New in mechanical construction

Identical with the Phoenix — the world's standard self-cleaning filter — in

1. Double pass filtering.
2. An endless curtain type of filtering medium.
3. Immersion principle of cleaning the filtering medium.
4. Freedom from oil entrainment.

Send for the Bulletin!

Has the following exclusive advantages:

1. Unit construction of standard width and any required height.
2. Motor drive can be eliminated without sacrificing ease of servicing.
3. Adaptable to volume manufacture, ease of shipping and erecting.

NATIONAL AIR FILTER COMPANY

5130 Ravenswood Avenue, Chicago, Illinois

H&V8-Gray

Clark Building, Pittsburgh, Pa. Architects and Engineers, Hoffman-Henon Co., Philadelphia, Pa.; Heating Contractors, George H. Soffel Co., Pittsburgh, Pa.

A business building buys on a business basis

In equipping the new Clark Building in Pittsburgh, the builders bought on a business basis. Nothing but equipment of known value was approved.

Jenkins Valves were installed throughout the heating system, and in the plumbing as well. They include Iron Body Globe Valves and Bronze and Iron Body Gate Valves.

Engineers and heating contractors serve their clients well by insisting on Jenkins Valves.

The line of Jenkins Iron Body Valves is described and illustrated in Folder No. 124. May we send you a copy?

Fig. 325 Jenkins Standard Iron Body Gate Valve, screwed

JENKINS BROS.

80 White Street.....New York, N. Y.
524 Atlantic Avenue.....Boston, Mass.
133 No. Seventh Street.....Philadelphia, Pa.
646 Washington Boulevard.....Chicago, Ill.

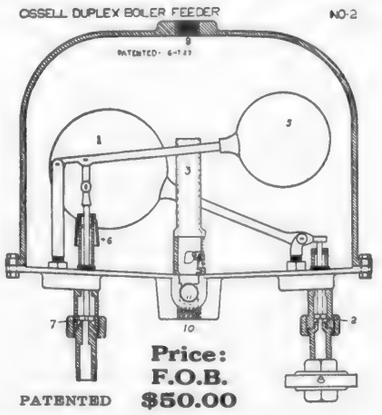
JENKINS BROS., LIMITED
Montreal, Canada London, England

Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

Now is the Time

For Real Boiler Protection

While Also Increasing Its Efficiency



PATENTED **Price: F.O.B. $50.00**

This Duplex feeder, built especially to meet conditions existing in heating boilers, will make your boiler absolutely automatic, eliminating danger of burning boiler or cracking sections. In selecting a boiler feeder you want the best; thousands of these feeders are in use and never a complaint. So sure are we as to its efficiency, that we sell it with an ABSOLUTE GUARANTEE.

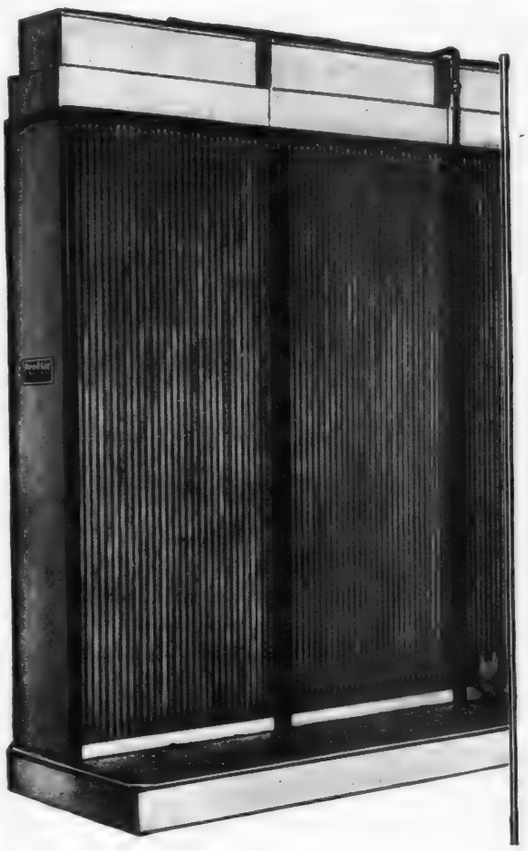
Write for Full Particulars and Discount

Manufactured by

W. M. CISSELL MFG. CO., INC.
111 South Second Street LOUISVILLE, KY.

Send the coupon for facts about the latest thing in Heating
CONVECTO
Bath Room
RADIATOR
In great demand for the modern bathroom
—handsome, compact, efficient, profitable
METAL STAMPING CO.
Established 1872
LONG ISLAND CITY, N.Y.
METAL STAMPING CO.
LONG ISLAND CITY, N.Y.
Please send information on the Profit making Convecto Bath Room Radiators.
PIN COUPON TO YOUR LETTERHEAD

If it's CLEAN AIR you want *This TEST will convince you*



IN Pittsburgh, noted for its dirty air, a Reed Streamline Filter in the McKees Rocks High School was tested over a period of ninety days. Unretouched photos of the Reed Visual Dust Comparators used in the test are reproduced below—*unquestioned proof of the high cleaning efficiency of the Streamline even under severest conditions.*

There are cheaper automatic filters than the Reed Streamline. But there is *no other automatic filter* that combines the high cleaning efficiency (95% to 98% guaranteed) and the low resistance to air flow (.30" constant) of the clog-proof, streamline filtering media—your assurance of trouble-free operation year after year.

Write today for actual photographs of the Comparators. No obligation.

REED AIR FILTER CO., *Incorporated*
218 Central Avenue LOUISVILLE, KY.
Representatives in Principal Cities
World's Largest Manufacturer of Air Filters

Reed Air

TRADE MARK

filters ALL METAL

The REED *Streamline Automatic Filter*

Entirely automatic. No personal attention required. Stationary media, consisting of vertical streamline baffles. Nothing to wear out or require replacements. Once a day the filter automatically cleans itself. No matting or clogging is possible. Reliable. Equally effective in the removal of *all* air-borne impurities.

Kees Rocks High School, Pittsburgh. *Visual evidence of the high cleaning efficiency of the Reed Streamline Filter.*

These two Dust Comparators remained for 90 days, one in front and one behind a Reed Streamline in the Mc-

Use This

REED AIR FILTER CO., *Incorporated*
218 Central Ave., Louisville, Kentucky

Send, without obligating me, the photographs offered above, together with full particulars on the Reed Streamline Air Filter.

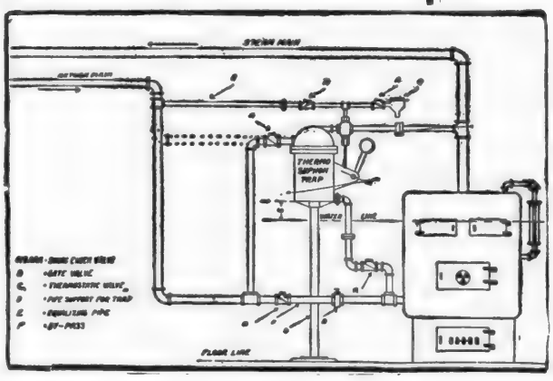
Name ..... City ..... Possible Use .....

Company ..... State .....

For All Types of Steam Heating Systems

Application of Thermo Syphon Trap, showing proper method of piping, for draining any heating system.

For draining vapor, vacuum or any system *without pressure on the returns*, the return line may be run direct to inlet of trap as shown by dotted line.



THERMO SYPHON TRAP

Poor Protection is more dangerous than none at all

THROWING the responsibility of protecting your boilers upon a trap that is not positive in operation, is more dangerous than having none at all.

With the Thermo Syphon Trap installed, your boilers are assured protection against burning or cracking, and can be relied upon for continuous and positive operation.

All condensation is returned to the boiler, maintaining the water line, regardless of pressure or vacuum.

Operates on any one or two-pipe steam heating system. Used with success on the various prominent patented Vapor, Vacuum, Atmospheric, and Modulation systems. Will also put new life in old heating systems.

Send for bulletin No. 16-HV giving full details.

LYTTON MANUFACTURING CORPORATION FRANKLIN, VIRGINIA

HIGH GRADE Return, Vacuum, Lifting and Separating Steam Traps, Reducing Valves, Blow-off Valves

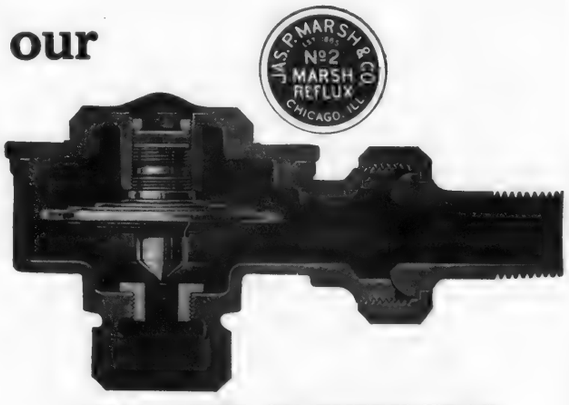
ANNOUNCEMENT of our forthcoming Catalog

Showing many new improved features in

Valves
Traps
Heating Systems

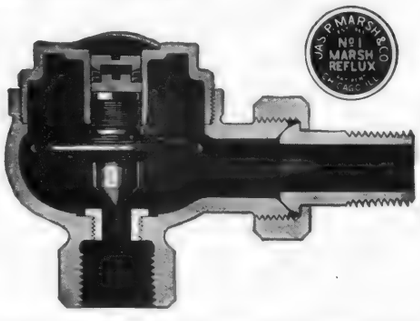
You'll need this catalog to keep up to the minute on new ideas in steam fitting and vacuum heating.

Send for it today
Your copy is ready



GUARANTEE ON EVERY TRAP

If any Marsh Reflux Trap might develop a defect in material, workmanship or operation inside of five years after date of installation, such Trap would be replaced free of charge.



Jas. P. Marsh & Co.

Established 1865 Over 60 years of dependable service.

114-124 S. Clinton St., CHICAGO, ILL.

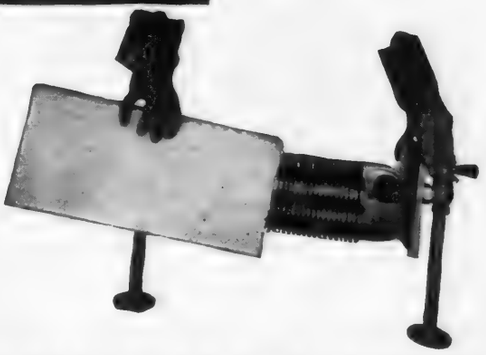
Offices in Principal Cities of the United States

FOREIGN DISTRIBUTORS:—Taylor-Forbes Co., Ltd., Guelph, Ontario. Chatterton & Co., 30 Fetter Lane, E. C. 4, London, England.

ROBRAS 20-20

Give Satisfaction

By INSTALLING



These ROBRAS 20-20 BATHROOM UNITS

So many of your customers are remodeling, building or installing additional bathrooms. They are on the look-out for the best, and most modern equipment. This out-of-the-way radiator is bound to please them.

Do you know this Bathroom Unit? It's constructed to fit in anywhere. It comes complete with a famous Robras 20-20 Radiator section, and lacquer metal enclosure. The enclosure can be slid on or off in any direction to facilitate installation.

These Bathroom Units come in six sizes—rated from five and a half to twenty-one square feet. Their dimensions vary from three and a quarter by eighteen, to five and a half by twenty-two and a half inches. They are all eight inches high.

If you have not already received our Data Sheet on the entire Robras 20-20 line of radiators, we will send it together with other material on receipt of your name.

ROME BRASS RADIATOR
CORPORATION

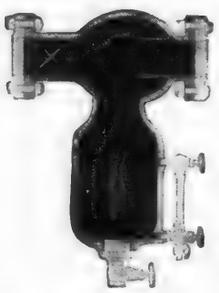
ONE EAST FORTY-SECOND STREET :·: :·: NEW YORK CITY

SWARTWOUT
Steam Products

Swartwout Air Separator
Either cast iron or cast steel.
99% Dry Steam Guaranteed

Swartwout Cast Iron Exhaust Head
Built to last a lifetime

Swartwout Low Pressure Float Trap
Large Capacity—Self-Cleaning Valve



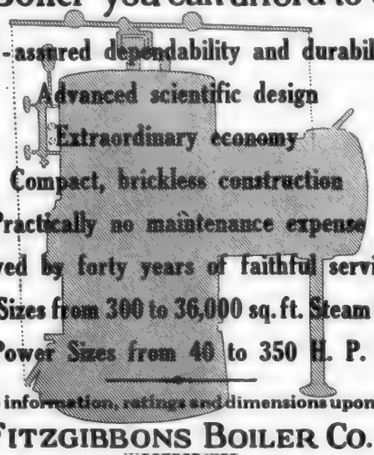
Swartwout Steam Separator
Separation by the centrifugal principle

Swartwout Bucket Type Steam Trap
Intermittent action—pressures to 250 lbs
Trouble-Free.

The products illustrated are only a part of the Swartwout line. We would like to give you full information on Swartwout Traps, Separators, Exhaust Heads and Strainers.

THE SWARTWOUT CO.
General Offices: **18525 Euclid Ave., Cleveland, Ohio**
Factories: **Cleveland and Orrville, Ohio**

FITZGIBBONS STEEL BOILERS
"The Boiler you can afford to own"



Steel-assured dependability and durability
Advanced scientific design
Extraordinary economy
Compact, brickless construction
Practically no maintenance expense
Proved by forty years of faithful service
Heating Sizes from 300 to 36,000 sq. ft. Steam Rating
Power Sizes from 40 to 350 H. P.

Complete information, ratings and dimensions upon request

FITZGIBBONS BOILER CO.
INCORPORATED
570 Seventh Ave., New York, N. Y.

HORNUNG
Pressure *and* Temperature
2 in 1
"Master Control" Valve
(PATENTED)
Industrial Type

Motor Operated Directly by Thermostat

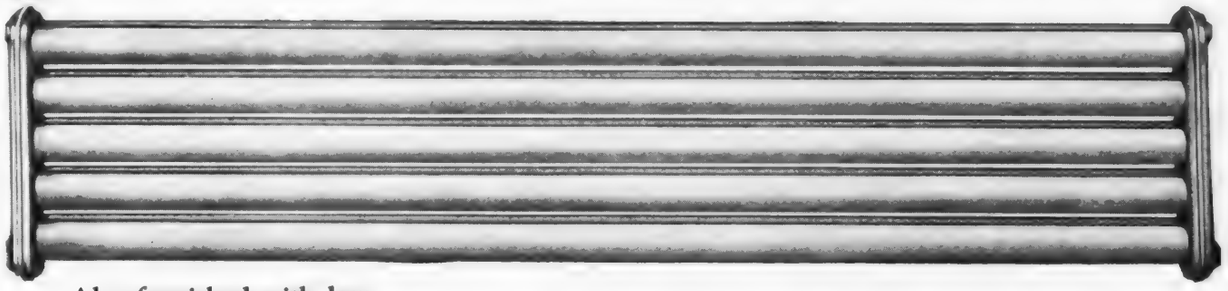
All Relays Eliminated ... ...

Especially Designed For Control of Steam Heat From a Central Station

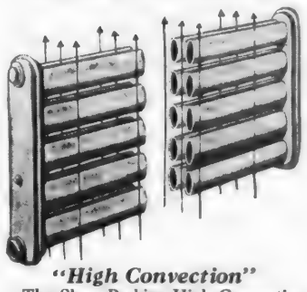
Let us send you our Bulletin giving full details

Central Heat Appliances
J. C. HORNUNG, *Engineer*
343 South Dearborn Street Chicago, Illinois
(3475)

The Modern Wall Radiator



Also furnished with legs for floor installation



"High Convection"

The Shaw-Perkins High Convection Radiator is all prime heating surface. The ingenious arrangement of the oval tubes allows the air to pass freely over the tubes, unimpeded by fins, baffles, or top and bottom hub connections, consequently the radiator has a high heat emission by convection.

Above view illustrates the high convection feature. Arrows indicate air travel. Note the absence of any impediments to free air circulation.

Shaw-Perkins
HIGH CONVECTION
Radiators

Low Narrow One-Piece Units As Long As 14 Feet

SHAW-PERKINS High Convection Radiators represent an advanced design in Shaw-Perkins standard oval tube radiation, which contains original and valuable features found only in this distinctive type of heating surface.

Light in Weight: The radiators weigh only one third as much as other forms of direct radiation. This absence of useless weight makes the radiators especially practical for suspension upon wall brackets. In comparison with pipe coils or sectional wall radiators, many joints and connections are eliminated and much labor saved by the use of Shaw-Perkins High Convection Radiators.

Heat and Cool Quickly: The light uniform walls of the radiators cause them to respond promptly to the turn of the valve, giving quick and positive control over room temperatures.

Save Space: The radiators save considerable space. While the radiators are built in several heights and numerous lengths up to 14 feet, the space saving is usually taken advantage of in the saving in height and width offered by the low narrow models.

Absolutely Sanitary: The radiators have no rough surfaces or fins to act as dust entanglements. All surfaces of the radiators are smooth and easily accessible for hand wiping.

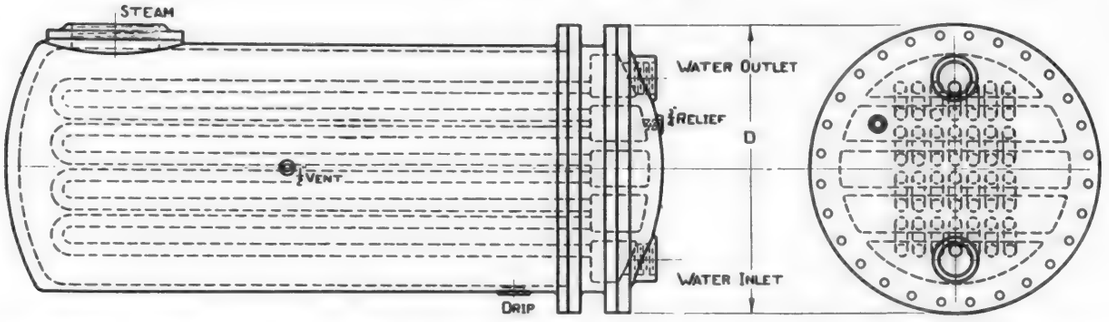
Unusually Adaptable: The distinctive design and unique dimensions of the radiators make them remarkably suitable for installation upon walls, under windows, in recesses, upon columns, pilasters, etc. They are most desirable for heating Factories, Warehouses, Greenhouses, Garages, Theatres, Churches, Stores, Dwellings, etc. The radiators are also particularly adapted to various drying and cooling purposes and to many industrial uses.

Get the Full Story of this Modern Radiator

SEND FOR CATALOG "H"

Shaw-Perkins Manufacturing Company, Pittsburgh, Pa.

NATIONAL
Instantaneous Heaters
U BEND TYPE



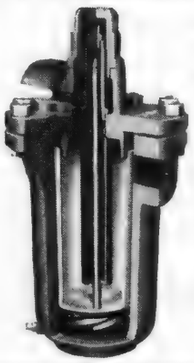
The Multi-pass Heater with the separately replaceable tubes

The tubes of this National Heater are so arranged as to permit the replacing of one tube without disturbing any other, and the absorbing element is removable for inspection. In addition the tubes are all one length and interchangeable. These three big features of National Instantaneous Heaters are exclusive in National design and should be considered by the shrewd buyer who desires lower maintenance cost. The shells are made for a working steam pressure of 75 lbs. per sq. in., and absorbing elements to a working water pressure of 125 lbs. per sq. in. Each installation is individually engineered, insuring perfect satisfaction. Write for Bulletin No. 55. Our engineers will call without obligation.

THE NATIONAL PIPE BENDING CO.

120 River St., New Haven, Conn. Boston—New York—Philadelphia

Trerice Steam Trap



Revolving valve cleans seat and produces uniform wear on same.

High chrome steel valve and seat. Sent anywhere for free trial.

Some good territory still available. Liberal contracts. Stock sent on consignment.

Write for full particulars to

H. O. TRERICE COMPANY
1338 West Lafayette Blvd.
Detroit, Michigan

Yes, send to

Name .....

Firm .....

Address .....

You will get this handy ATLAS Junior Catalog No. 21 by return mail. Just what every heating and ventilating engineer needs. Temperature regulators, Damper Regulators, Pressure Regulators, etc.

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South Street, Newark, N. J.

Service The *Satisfaction*

VECO SYSTEM of VAPOR HEATING

An "Open to atmosphere" system.
The original and standard method of
Vapor Heating

VAPOR ENGINEERING COMPANY

PHILADELPHIA—10 So. 18th Street
J. Wilbur Glassey—M. S. Buck

NEW YORK—489 Fifth Avenue
Chas. E. Scott—R. C. Willis

1 Horse Power Century Type RS
Repulsion Start Induction Single Phase Motor

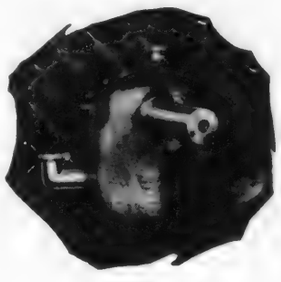
For Electric Refrigerators Oil Burners and House Pumps

The ability of Century Type RS Repulsion Start Induction Single Phase Motors to continuously meet all of the service and power supply requirements of such installations as electric refrigerators, oil burners and house pumps, makes them the logical choice for these and other installations, especially where high starting torque and low starting current are desirable.

They operate quietly. Static and running balance tests are applied to each armature, eliminating vibration to the greatest degree commercially practical.... Bearings are long lived. They are machined from phosphor bronze castings, the highest grade bearing material obtainable.... Ball bearings can be furnished when needed.... Brushes and commutators last. Brushes touch the commutator only during the starting period, about 1/900th part of the time the motor is operating.

Built in standard sizes from 1/8 to 40 horse power.

At least one year's continuous 24-hour-per-day operation, without reoiling, is assured by the Century Wool-yarn System of Lubrication. This is standard for 1 horse power and smaller motors.



CENTURY ELECTRIC COMPANY

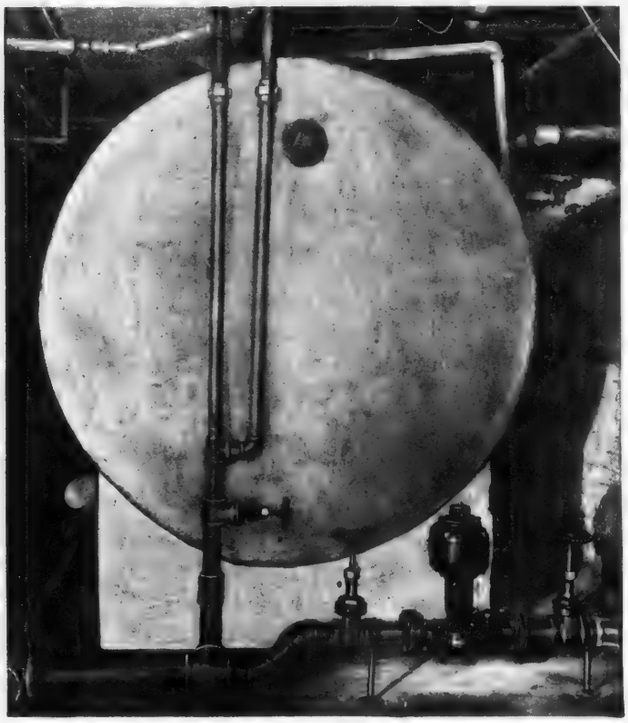
1806 Pine St. St. Louis, Mo.

35 Stock Points in the United States and More Than 50 Outside Thereof

Century MOTORS

"THEY KEEP A-RUNNING"

Assures Rapid Circulation on New or Old Hot Water Systems



Installation at Independence Park Field House, Chicago. One 2-inch HYDROLATOR and two Excelso Heaters have replaced a large boiler for heating water in a 2000-gallon tank. Only 2 hours required to bring cold lake water up to shower bath temperature.

YOU can solve almost any hot water circulation problem with a HYDROLATOR. Install this pump on either a hot water heating system or a domestic service water system—old or new—and rapid circulation is assured.

The HYDROLATOR makes possible an efficient and economical hot water system regardless of whether the radiators or coils are above, below, or on a level with, the boiler.

Very quiet. Costs little to operate. Requires only one or two oilings a season.

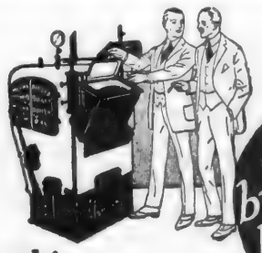
Write for full information.

Janette Manufacturing Company
556-558 West Monroe Street
Chicago

Singer Bldg.
149 Broadway
NEW YORK

Real Estate
Trust Bldg.
PHILADELPHIA

The Reg. U. S. Pat. Office
HYDROLATOR



NO FORCED DRAFT

burns No. 1 Buckwheat

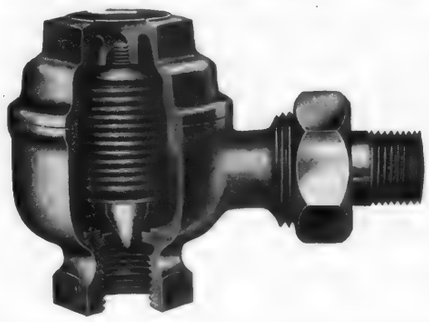
Breaking the Record for Low Coal Bills and Efficiency!

Low pressure steam and hot water heating boilers and tank heaters that burn No. 1 Buckwheat . . . . . No mixing with expensive coal . . . . . Magazine needs filling only once in 12 to 24 hours . . . . . No blower. No motor. No electric current. No machinery to get out of order . . . . . Twenty-one sizes . . . . . *Coal bills cut one half!*

Have you our Catalog and Price Sheets?

The MOLBY HEATING BOILER
***and* Heavy Duty Tank Heater**
MOLBY BOILER COMPANY
(Subsidiary of The Universal Pipe and Radiator Company)
New York: Graybar Building, 420 Lexington Ave.
Landsdale, Pa.: 41 Central Ave.

THE No. 3 THERMOFLEX-HYDRON ANGLE RADIATOR TRAP



The Hydron Bellows is the only **hydraulically formed proof-tested** bellows used in thermostatic radiator traps today. Each and every bellows is subjected to several hundred pounds, internal hydraulic pressure in the making. Weak, uneven, or defective metal **will not** make a Thermoflex-Hydron Bellows.

Our new complete catalog No. 52 is now ready for delivery. Gladly mailed upon request.

W. D. CASHIN COMPANY
35 Hartford Street **Boston, Mass.**

Lad defines sense egg-actly

"Here, Lad—

I've just been talking with the man from whom I've bought motors for years.

I told him what you said about every going and growing factory in our vicinity throwing out cast iron motors and standardizing on 'Linc-Weld' STEEL motors, so I asked him why it was.

He told me that it was 'Linc-Weld' departures from general practice that captured people—but he confidentially advised me that the so called improvements had no sense to them at all."

"Linc-Weld" Superiority is due to:

1. **Larger Shafts**
2. **Larger Bearings**
3. **Better Insulation**
4. **Stronger Frame (Steel)**
5. **Greater Overload Capacity**

"Sure, Pop—

not from his dim viewpoint.

You'd hardly expect your grocer to tell you that his competitor's eggs were fresher than his. And if he had your motor maker's type of thinking, he'd stand up for those eggs until they hatched—while the progressive dealer took his trade.

It's the USER who sees the sense in 'Linc-Weld.'

Of course, your man can't see any sense to 'Linc-Weld' double size bearings, while he's still sticking to the peanut size. But the factories around here report a fine clean-up of bearing failures since they sensed the sense of it.

Of course, your man can't see any sense in a steel frame, since he operates a grey iron foundry—but the factories I've visited have found in 'Linc-Weld' STEEL FRAME motors a means for obviating production let-downs.

Of course he can't see sense to it—Did you ever see a homely girl who wasn't willing to tell you that her pretty rival has no sense AT ALL?"

The Lincoln Electric Co., Dept. No. 16-8, Cleveland, Ohio

M-18

"Linc-Weld"

LINCOLN MOTOR

SIMPLICITY is the keynote both of construction and operation of the Type F-2" Metaphram Damper Regulator. The Metaphram Discs are separable and are held in a strong, light brass cage.

This permits of the unit being lifted from the well for replacements, should this ever be necessary, without draining the boiler.

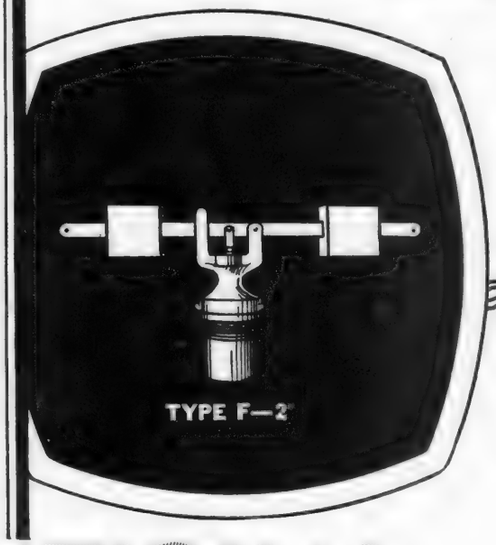
You will find nothing to surpass the Type F-2" for simplicity nor for dependable operation on any hot water boiler.

Poor or costly operation of a boiler is often due to the wrong sized damper regulator being used. We always specify the correct size Metaphram Damper Regulator for every type of boiler.

Write for the Metaphram catalog.

National Regulator Co.
2309 N. Knox Ave. Chicago, Ill.

FOR HOT WATER HEATING SYSTEMS



METAPHRAM

NATIONAL METAPHRAM DAMPER REGULATOR

THERMOSTATIC METAL

The most accurate, constant and durable of expansion units

FOR LOW AND HIGH TEMPERATURES

Our No. 1800 metal for temperatures below 450° F.
Our No. 2600 metal for temperatures below 1500° F.
Other High Heat Metals for special uses.

Positive and Dependable Thermostatic Metals

W. M. CHACE VALVE COMPANY
1600 Beard Avenue
Detroit, Michigan

New Home Study Course in Gravity Steam and Water Heating

The New Home Study Course in Gravity Steam and Water Heating which has been one of the most popular features in THE HEATING AND VENTILATING MAGAZINE during the past two years is now ready in loose-leaf form (without instruction features) for the astonishing low price of

$10.00

Never before offered in reprinted form except to purchasers of the correspondence course which sells for $120.00. Send for full details.

HEATING & VENTILATING MAGAZINE CO.
396 Fourth Avenue NEW YORK

Save ½ Your Coal Bill

Write for booklet containing complete details and list of prominent installations giving satisfactory service.

Sole Distributors in United States and Canada

WITH COPPUS (REGISTERED U.S. PAT. OFFICE) UNDER-GRATE DRAFT BLOWER

In Homes, Dwellings, Office Buildings, Garages, Churches, Schools, Public Buildings, etc.
The COPPUS burns the cheaper grades of coal, with no waste. Every pound of coal is burned. Easily installed with no change of grates.

INTERNATIONAL FUEL SERVICE CORP. BRIDGEPORT, CONN.

"CLICK" goes the customer's mind

When you tell him there's a *fuel-less* water heater that will give him hot water—*plenty—always*

SCORES of heating contractors have discovered Taco. They've tried it out, found that, in the proper size, it gives a continuous supply of clean hot water, without gas or extra fire. And now these men hook up a Taco every time they put in a heating plant.

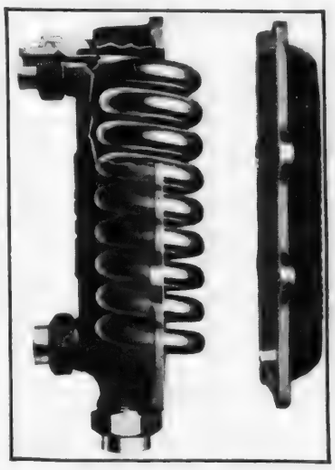
Why are they so successful in adding this profitable item to every job? Because Taco is the easiest thing in the world to sell a customer.

Tell any home owner that he can have hot water always on tap—as much as he wants—for seven months of the year without burning gas or any extra fire. Tell him that, and will he listen? Will a starving man eat lamb stew?

Every new construction steam job you handle offers you a chance to install a Taco. No building is too large—no bungalow too small.

Every home or building in your territory now heated by steam is a chance to replace a firebox coil or extra-fire heater with a clean-cut, profitable Taco job.

Why not assure every steam job customer a never failing supply of hot water at an operating cost that's next to nothing. If you are not already putting in Tacos you will be interested in the Taco story. Epecially the facts concerning the Super Taco, the water heater with three connections to the boiler. We will gladly give you all the facts and engineering data—show you how to add the finishing touch to well-installed jobs. A post card brings you the whole interesting story.



TACO HEATERS, INCORPORATED

Successor to Thermal Appliance Company

342 Madison Avenue New York City

Makers of

TACO

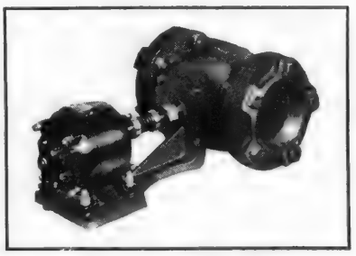
Automatic **FUEL-LESS** *Water Heaters*

ANNOUNCING

THE KETCHUM

COMPELLER

Another **Sterlco** TRADE MARK *Product*



Patent Applied For

Designed to insure positive circulation in hot water heating systems, thus increasing the heat conducting efficiency of the water and making possible a more economical and uniform distribution of heat.

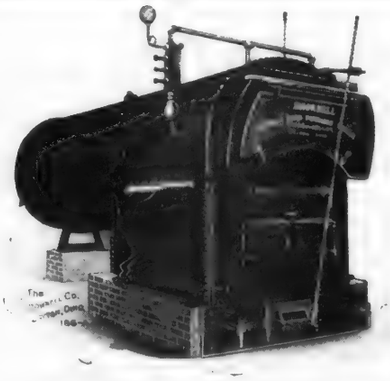
Noiseless in Operation

No by-pass or check valves required

Can be operated automatically in conjunction with draft dampers or oil or gas burner control.

STERLING ENGINEERING CO.
1626-44 Holton Street
Milwaukee, Wis.

Sales Representatives in all principal cities



Brownell Portable, Direct Draft Boiler

Sheer Excellence
And Nothing Less

can keep any product on the market 73 years. In the case of Brownell Boilers that excellence is due to designs that are sound basically, up-to-date, and exactly suited to particular requirements.

Many styles in varying capacities—every one built to meet the ASME Code and the Boiler Laws of your own State.

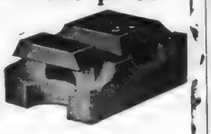
Consult nearest Brownell representative, or write Home Office. Also write us for Bulletin B-6-A.

THE BROWNELL COMPANY, Dayton, Ohio

BROWNELL BOILERS

Do You Still Use Large Domestic Coal?

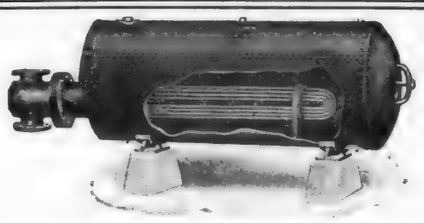
Why not economize by using Buckwheat Coal—at about half the price of domestic coal?



You can burn Buckwheat with PYRAMID GRATES

Let Us Send Full Details

PYRAMID IRON PRODUCTS CO.
230 East 41st Street **New York City**



Engineers' specifications are generally "Frank." Our Straight Tube and U-Tube heaters are built for durability. All parts are of flange steel. They have the unreserved approval of leading heating engineers.

Write us for full details

O. E. Frank Heater & Engineering Co., Inc.
Factory and Offices at Buffalo, N. Y.

The No. 999 Packless has new low price—it is mechanically improved—it opens and closes with one easy turn—its composition handle never gets hot—it is guaranteed not to leak. The No. 999 is furnished in angle, corner and globe patterns for steam, water, vapor or vacuum. Fractional type for vapor.

"I know we can sell the new NO. 999 *on every job"*

THAT is what a successful member of the heating profession said when he first saw the new Arco Packless Valve No. 999.

He continued, "It's simply a matter of sound reasoning. Here is a fine valve of high quality and at a low price. One that will not leak nor ever need repacking. It is a mistake for us to go on equipping good radiators with cheap valves when we can give our customers a valve like this new No. 999.

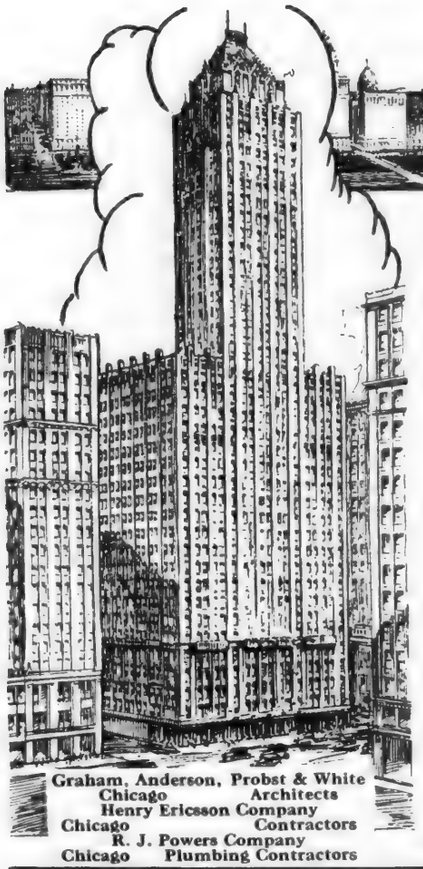
"We are suppposed to know our business and see to it that our clients get good heating equipment—well, from now on they will—for the new No. 999 goes on every small residence job as well as the bigger jobs."

AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION, DEPT. APV78

40 West 40th Street New York, N. Y.

Makers of IDEAL *Boilers,* AMERICAN *Radiators,* ARCO *Tank Heaters,* VENTO *Ventilating Heaters,* AIRID *Air Valves,* MERCOID *Controls and devices for drying, humidifying, cooling and refrigeration.*



Graham, Anderson, Probst & White
Chicago Architects
Henry Ericsson Company
Chicago Contractors
R. J. Powers Company
Chicago Plumbing Contractors

Hot Water for the highest building in the famous Chicago Loop is supplied by Whitlock Heaters

The Pittsfield Building, in the center, towers above all surrounding skyscrapers. It is two feet higher than the Washington Monument—555 ft. The Whitlock Type K Heaters have to stand enormous pressure resulting from this height. They do . . . and they furnish an ample supply of hot water. The installation consists of two heaters, 36″ x 120″, with an hourly capacity of 2,000 gallons each, for the main building and two 30″ x 108″ with an hourly capacity of 1,000 gallons each, for the tower. Our engineers are subject to your call for consultation on any plans you may have in your office.

THE WHITLOCK COIL PIPE CO.

40 South Street **HARTFORD, CONN.**

New York, Boston, Philadelphia, Chicago, Baltimore, Detroit, Los Angeles, San Francisco and other principal cities. Consult telephone book.

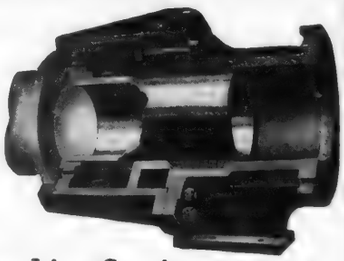
GRADON MANUFACTURING COMPANY

Heat Exchange Equipment
Expansion Joints — Separators

ENGINEERED GraDon PRODUCTS
TRADE MARK

Engineering Dept. Land Title Building
General Offices and Plant East Tioga and Memphis Sts.
PHILADELPHIA, U. S. A.

HOWARD Guided Expansion Joint



For Pipe Line Service

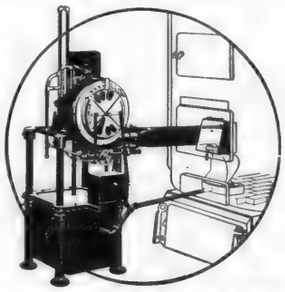
Eliminates trouble from Expansion and Contraction, saves space, labor and repair bills; the construction is mechanically correct.

ALBERGER HEATER CO.
HOWARD IRON WORKS
285 Chicago St.
Buffalo, N. Y.

Continuous Flame

No Gas Pilot
No Electric Ignition

Distributors
Write for the 1928-29 Sales Plan



McILVAINE OIL BURNER
Listed by Underwriters

Dependable Heat

Graduated Automatic Control
Mechanical Draft

McILVAINE BURNER CORPORATION
Dept. H 749 Custer Ave.
EVANSTON, ILLINOIS

MANNING, MAXWELL & MOORE, Inc.

buys the

AMERICAN SCHAEFFER & BUDENBERG CORPORATION

MANNING, MAXWELL & MOORE, INC., has purchased the entire business of the American Schaeffer & Budenberg Corporation, including good-will, trade names, trade marks, patents, etc., and it will merge that business with the business of its subsidiary company, Consolidated Ashcroft Hancock Company, Inc.

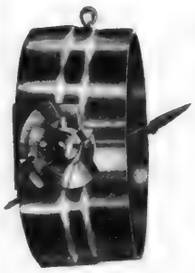
Consolidated Ashcroft Hancock Company, Inc., which is owned exclusively by Manning, Maxwell & Moore, Inc., is the operating company handling the manufacture and sales of their Steam Specialties business. This includes the well-known lines of Ashcroft Gauges, Consolidated Safety Valves, Hancock Valves, Inspirators, etc.

The complete American Schaeffer & Budenberg line, including Gauges, Safety Valves, Thermometers and Recording Instruments for a wide range of service, will be manufactured and sold in conjunction with Consolidated Ashcroft Hancock products.

A liberal constructive policy, involving more extensive research and development work of a scope impossible with either company when separately operated, has been adopted.

This merger places under one ownership the most important and meritorious line of Steam Specialties in the United States.

MANNING, MAXWELL & MOORE, Inc.
100 East 42nd Street, New York, N. Y.



Preferred 100% Automatic Damper

Double Barrelled

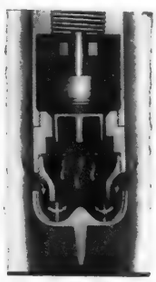
All the Preferred Utilities give you double barrelled protection:

1—They are scientifically and practically designed to give highest efficiency and accuracy.

Preferred Foot Valve

2—They are sturdily made with best workmanship and material to stand the gaff of long and hard usage.

Guard your profit and reputation by always equipping your oil burner with Preferred Utilities.



Cross section Preferred Foot Valve

Business is built on reputation today — That is why we make Preferred Utilities the quality oil burner accessories and that is why those who install oil burners want to get Preferred protection with:—

Preferred Utilities:

PREFERRED 100% AUTOMATIC DAMPER
PREFERRED FOOT VALVES
PREFERRED ANTI-SYPHON VALVES
PREFERRED DOUBLE TAPPED BUSHINGS
PREFERRED FLUSH BOXES
PREFERRED VENT PROTECTORS

Other Preferred Utilities are in our laboratory and on test in the field.

Exclusive Distributors for Absolute Con-Tac-Tor Corp., in New England, New York and Northern New Jersey. Complete stock carried in New York City.

PREFERRED UTILITIES MANUFACTURING CORP.
33 West 60th St., New York, N. Y.

Apartments

TUDOR CITY

GRAYBAR BUILDING

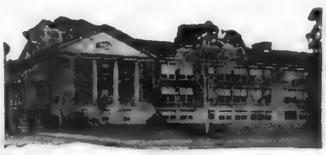
Office Buildings

HOTEL OLDS

Hotels

PRESBYTERIAN HOSPITAL

Hospitals



NORTHSIDE HIGH SCHOOL

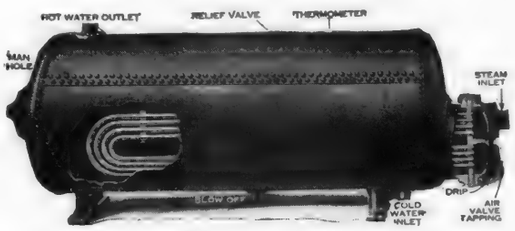
Schools

H. J. HEINZ CO.

Factories

Wherever a constant supply of hot water is necessary you will find

Patterson Hot Water Heaters



The Patterson-Kelley Co.

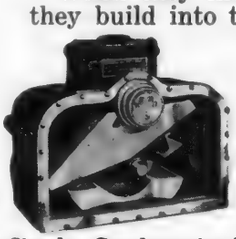
107 East 40th Street New York City

Send us your BLUE PRINTS for recommendations and prices

LEADING heating contractors and engineers—men who install the largest and most important steam line work, both underground and aerial, high and low pressure—have made it a practice for years to send their blue prints to ADSCO for recommendations and prices.

When they install ADSCO Equipment, they build into their lines the same kind of dependable operation that has been tried and proven by fifty years of service. In many cases they have found that the recommendations of ADSCO Engineers have resulted in a more efficient layout and a considerable saving in installed cost.

Send us your blue prints. Better to install ADSCO Equipment now than to wish you had when it is too late.



Adsco Simplex Condensation Meters

Success in District Heating necessitates accurate metering. Manufacturing cost analysis requires measurement of departmental steam consumption. The ADSCO Simplex Condensation Meter serves either purpose economically, dependably and efficiently.

Adsco Red Diamond Brand Casing

More than 91% heat efficiency, with 20 to 25 years proven service are combined with low cost and ease of installation in ADSCO Red Diamond Brand Casing. Thoroughly water-proofed, carefully lined stave construction for all pipe sizes to 24" O.D.

Adsco Packless Variators

Particularly desirable for inaccessible locations where pipe movement must be taken up without strain on fittings or leaks. Proven by more than thirty years of operation on all services.

ADSCO Specialties for steam distribution lines have been kept up to date for over fifty years and today embody the principles of design and construction that insure long, trouble-free service. When you install ADSCO Products you know that your steam lines will operate efficiently at minimum maintenance . . . hundreds of other installations have proven this.

Empire Steam Trap for Low Pressure

Known for years for its simplicity and dependability. Continuous, carefree service insured with low cost and negligible maintenance.

AMERICAN DISTRICT STEAM COMPANY

GENERAL OFFICES AND WORKS

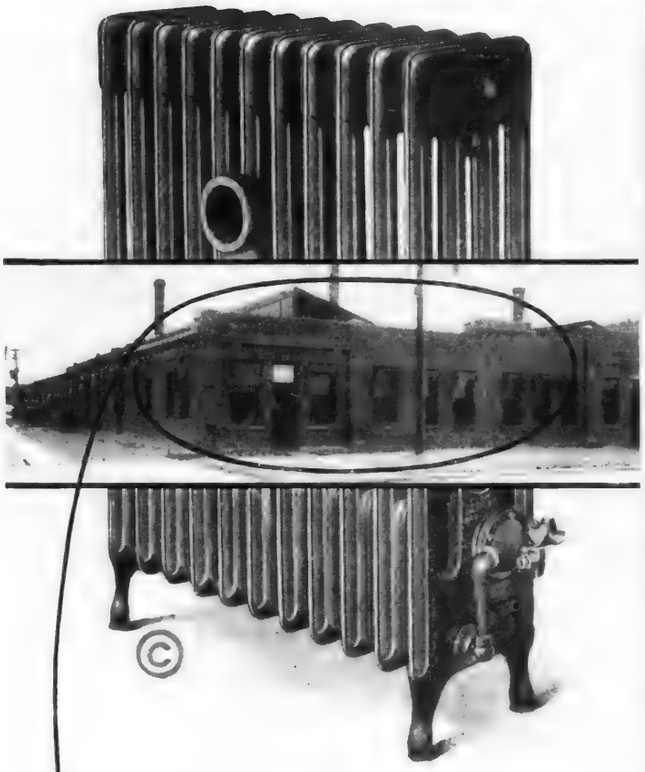
NORTH TONAWANDA, N.Y.

ADSCO

EXPANSION JOINTS - CASING - METERS - STEAM TRAPS - REDUCING VALVES - GATE VALVES

Adsco Nelson Gate Valve

Incorporates the combined knowledge and experience of the manufacturers of the ADSCO Valve and the Nelson Valve. Designed particularly for service on District Heating systems where continuous, dependable service is essential.



Profitable Heating Business You Can Get— 5 Radiators Brought 50 More

Above is the American Three-way Prism Company, 1315 S. 55th Ct., Cicero, Ill. — where 5 Clow Gasteam Radiators provide all the heat required by the office *all year*.

Fall, Spring, and after hours, these radiators supply office heat without wasting heat on the factory section which does not need it.

These Gasteam Radiators have been found so convenient—so practical—that their company has purchased about 50 additional radiators for use in their factory.

Gasteam can mean a good, profitable business for heating contractors, in plants such as this, and in many other types of jobs. Send for our catalog today.

JAMES B. CLOW & SONS
201-299 North Talman Avenue, Chicago

CLOW GASTEAM

Announcing

DRAFT-A-JUSTOR

Formerly
BREESE DRAFT REGULATOR
—an old friend.
Further justifies your confidence

Important improvements have made DRAFT-A-JUSTOR the ideal unit for use on all types of installations.

New bearings insure accurate results on all draft settings. Existing friction on horizontal axis adjustment overcome as the DRAFT-A-JUSTOR valve on a low draft bears on a hardened steel point.

Constructed of substantial material finished in two color baked enamel, thus insuring long life.

Weight changed from arm to ball type, thus preventing its contact with the sleeve.

Elimination of the possibility of any noise in operation.

These ADVANTAGES in addition to—

AUTOMATIC CONSTANT DRAFT
ELIMINATION EXCESS DRAFT
INCREASED EFFICIENCY
FUEL SAVING
LABOR SAVING
SIMPLE ORIGINAL ADJUSTMENT
REDUCED STACK TEMPERATURES

and many others, make the DRAFT-A-JUSTOR desirable on every installation, regardless of type of fuel used. "Every chimney a prospect."

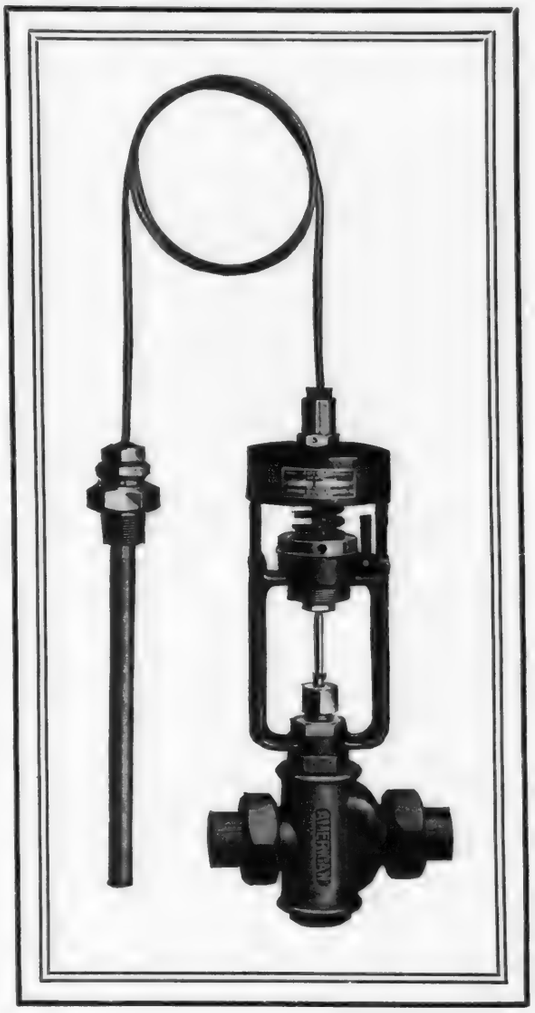
WRITE TODAY for a copy of the DRAFT-A-JUSTOR Manual.

DRAFT-A-JUSTOR CORP.
513 W. JACKSON BLVD.
CHICAGO, ILL.

Have You Tried It Yet?

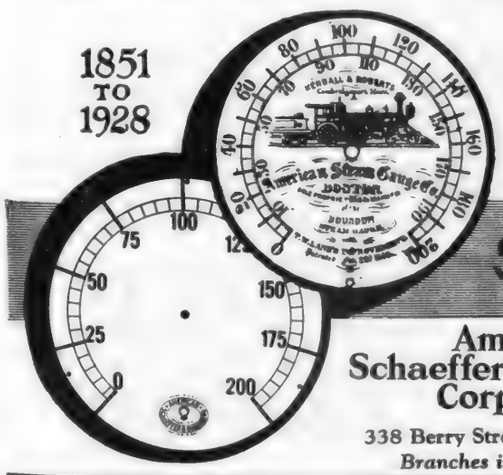
If you haven't tried out the new American Precision Temperature Controller, do so now at our expense. When you install the next hot water heater, you will want to equip it with this new instrument. It means better regulation —to within 1° F, if conditions are favorable.

Test one yourself. Examine the construction carefully. Give it a thorough trial. See what it will do and how you like it. There's no obligation. You will not be expected to keep it unless you are completely satisfied.



Simple to install. Self-operated. Positive in action. Rugged in construction. Low in cost.

Mail the coupon today for description and prices.



AMERICAN INSTRUMENTS

SINCE 1851

American Schaeffer & Budenberg Corporation

338 Berry Street, Brooklyn, N. Y.

Branches in principal cities

American Schaeffer & Budenberg Corp.,
338 Berry St.,
Brooklyn, N. Y.

Please send me your folder R-14 on the New American Precision Controller

For .....

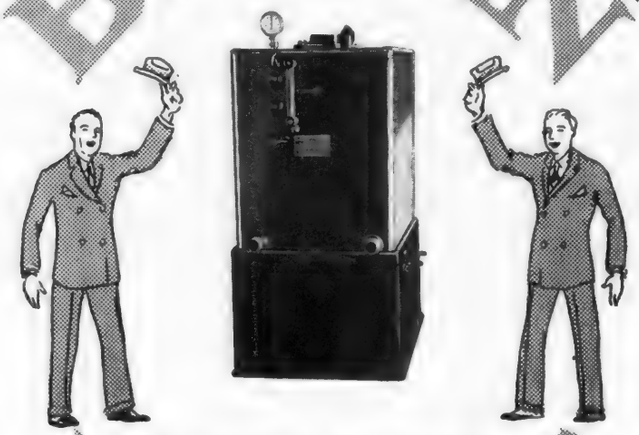
Name .....

Company .....

Street .....

City ..... State .....

BRYAN BOILERS



Designed especially for Oil & Gas

Oil-Burner manufacturers throughout the country report a continuous increase in their sales volume, which only reiterates the fact that the use of oil for heating purposes is becoming more and more popular. To burn oil with the most efficiency and economy requires a boiler built specifically for the purpose.

There is an ever increasing trend, today, toward modernized household appliances. Here is an avenue which many dealers are using to increase their annual income. Every Oil-Burner user is a live prospect for a Bryan Boiler (built specifically for oil or gas), and can be easily convinced that Bryan Boiler offers the utmost in efficiency, economy, cleanliness, appearance and ease of operation. What more could be desired in a merchandising proposition?

Write us today for complete information.

BRYAN STEAM CORP.
(BOILER DIVISION)
502 Bryan Bldg. PERU, INDIANA

Blake Cast Iron or Brass Water Heaters

Nothing to Compare With These Either in Price or Efficiency

K-1320 K-1325 K-1330 K-1335 Cross Section

Made to fit any size Boiler or Furnace. Heating surface one foot. Will carry 35 ft. of Radiation. Most suitable Water Back for 30 or 40 gallon Range Boiler.

Brass Cleanout at Bottom for Blowing out Sediment.

Fig. K 1320—Lengthened out for any Holes in Boiler. Fig. K 1325—2½" Centers—K 1330—2" Centers. K 1335—9" Centers.

Tappings ¾ or 1 inch—Measurement 2¼x3¼x12. Weighs about 8½ lbs.

Your Jobber Will Furnish Them

BLAKE SPECIALTY CO.
ROCK ISLAND, ILL.

You sell satisfaction when you sell Teeple Controls

ELECTRIC GAS VALVE

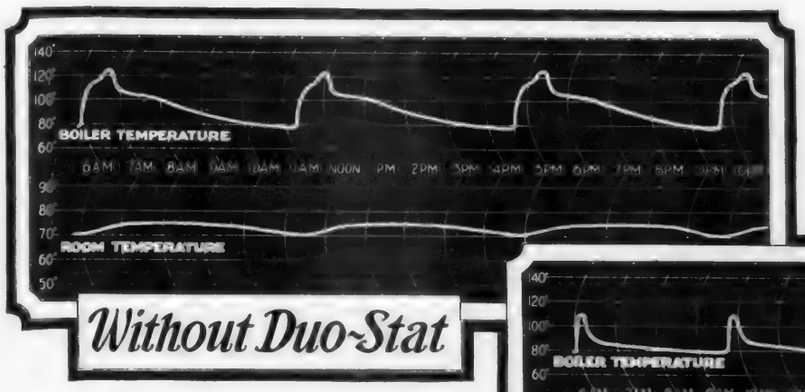
Customers expect accuracy and reliability in temperature controls. They are sure of these qualities when you sell them Teeple instruments. They meet every problem of heat control for gas furnaces and boilers; unit heaters; refrigerating plants; ovens; furnaces; and automatic coal and oil burners. You can recommend them.

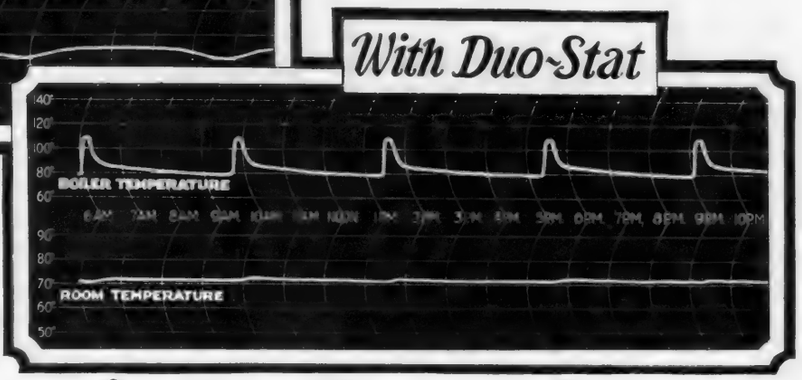
Write for this new Catalog . . . . . .

Our latest Catalog fully illustrates and describes the full line of Teeple Controls. Gladly sent.

L. R. TEEPLE CO.
540 E. 9th St., Portland, Oregon

TEEPLE
TEMPERATURE
Controls
for GAS — STEAM — WATER — AIR





One sure way to give super-performance

on a gas-or oil-fired job

THE Raymond Duo-Stat was designed primarily to give a new degree of heating comfort. It accomplished this by giving a fineness of temperature regulation hitherto considered impossible. Along with this better regulation goes fuel saving that *pays for the Duo-Stat*.

The charts above tell the story of regulation and economy more effectively than could any description. The upper chart shows the regulation with room thermostat and a fixed limit on the boiler. The lower chart shows the result with an ordinary room thermostat and the boiler limit compensated for outside temperature by means of the Raymond Duo-Stat.

Note the long periods of burner operation each time the room thermostat calls for heat where dual control is not used. Also note the tendency of the room temperature to build up *after* the burner is cut-off. In milder weather this causes a fuel waste of 20 to 50 per cent. And along with this waste goes the intermittent stuffy and chilly conditions caused by the lag in burner operation. Contrast this with the short firing periods, flat curve of room temperature, and obvious fuel economy produced by the Duo-Stat.

Be posted this fall

Your success depends on your ability to make good on every claim of super-performance. The facts about the Raymond Duo-Stat will convince you that one of the greatest single factors in *producing* super-performance is the weather compensating control made possible by the Raymond Duo-Stat alone.

What the DUO-STAT accomplishes—

1. Avoids hot and cold radiator nuisance.
2. Gives uniform temperature near windows and radiators as well as at the thermostat.
3. Eliminates overheating under all conditions.
4. Eliminates the uncomfortable condition known as "cold 70."
5. Pays for itself in fuel saved—and then pays a dividend.
6. Makes the regulation automatic in *fact* as well as in name.

Booklet explains how and why—

The 8-page booklet clearly explains the operation of the Duo-Stat. Get the facts now.

Coupon brings booklet

Please send booklet giving the how and why of the Raymond Duo-Stat

Company_____

Individual_____

Street and Number_____

City and State_____

Mail to F. I. Raymond Co. Builders' Building Chicago

F. I. RAYMOND COMPANY, BUILDERS BLDG., CHICAGO

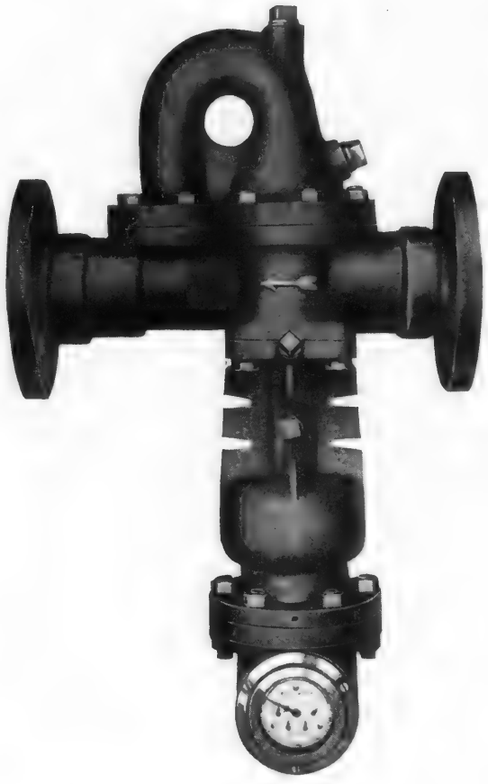
Originators of Automatic Dual Heat Control

The Raymond DUO-STAT

WEATHER COMPENSATING

If it hasn't a Duo-Stat —it isn't fully automatic

Shunt Steam Meters are in Use by a Variety of Industries



Industry promptly responded to the announcement of a low-priced meter for steam, air, and gas lines. As a result Shunt Meters are already in use serving

OIL REFINERS
CHEMICAL COMPANIES
HARDWARE MANUFACTURERS
MEAT PACKERS
DAIRIES
COLLEGES
RAILROADS
STEEL MILLS
PAPER MILLS
TEXTILE MILLS
RESTAURANTS
HOTELS
CENTRAL STATIONS
DISTRICT HEATING COMPANIES
NEWSPAPER PUBLISHERS
REFRIGERATION PLANTS
MINING AND SMELTING PLANTS
MOTOR MANUFACTURERS
OFFICE BUILDINGS (selling steam to tenants)
TESTING LABORATORIES
GAS COMPANIES
ETC.

A considerable number of the Shunt Meters sold to the industries listed above were purchased for use on heating lines. Wide range of accuracy, ease of installation, low first cost and practically no upkeep expense are reasons why these Meters are well suited for such use.

Bulletin No. 234 is brief but complete. Even if you have no present need for steam or air meters we want you to have this bulletin on file. Just send us your address.

BUILDERS IRON FOUNDRY

"Builders of the Venturi Meter for 36 years"

11 Codding Street **Providence, R. I.**

No leaks can develop in this steam line

THIS welded underground steam main is made entirely free to expand and contract by welding in BADGER SELF-EQUALIZING EXPANSION JOINTS that cannot leak.

The one-piece expansion element is made from a copper tube, which is deeply corrugated by a special process. External equalizing rings are fitted between the corrugations to distribute the movement uniformly throughout the element. There are no sliding members, stuffing boxes or packing to contend with.

The pipe line is properly anchored and guided by means of standard Badger Pipe Guide Fittings that are bedded in concrete blocks. Anchorage is secured by welding lugs on each side of the strap.

Guaranteed for all working pressures to 200 lb.

Write us now for Bulletin

Badger Engineering Service

Badger engineers are designers manufacturers and installation experts for the following and kindred power plant products: Pipe Bends, Chemical Apparatus, Copper and Sheet Metal Work, Copper Boilers.

E. B. BADGER & SONS CO.

75 Pitts Street, Boston, Mass.

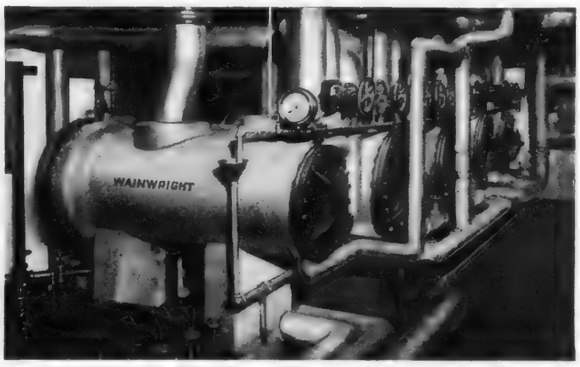
New York: 271 Madison Ave. **Tulsa, Okla.: Mid-Continental Bldg.**

Representatives in all principal cities

BADGER EXPANSION JOINTS

ESTABLISHED 1841 · WEATHER VANE ON FANEUIL HALL · TRADE MARK · E. B. BADGER & SONS COMPANY

Constant Hot Water Supply for Hotels



The Wainwright hot water heater installation in one of the leading New York hotels. Wainwright heaters can be of the vertical or horizontal type.

Wainwright heaters are built for any size project, hotels, apartments and hospitals.

The accompanying illustration shows the Wainwright heaters installed in one of the largest and most modern hotels in New York City. Aside from supplying hot water for the guests, kitchens, etc., the heaters furnish hot water for the complete hotel laundry. The piping is so arranged that the heaters for high, intermediate and low pressure are interchangeable, so that in emergencies any one heater can handle the hot water supply to all floors.

Wainwright heaters are built for any capacity or temperature range. Either exhaust or live steam can be used for heating the water.

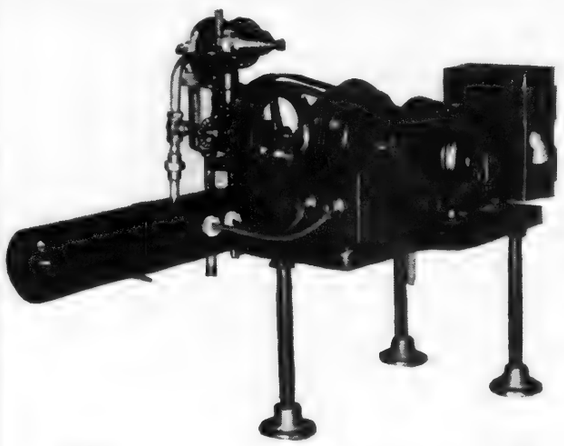
FOSTER WHEELER CORPORATION
165 Broadway, New York, N. Y.
Branches in Principal Cities

Foreign Associates:—
Foster Wheeler Limited; London, England.
Foster Wheeler Limited; Toronto-Montreal-Vancouver, Can.

AERO UNIT COAL PULVERIZING
AIR HEATERS CENTRIFUGAL PUMPS
CONDENSERS COOLING TOWERS
ECONOMIZERS EVAPORATORS
EXPANSION JOINTS FEED WATER HEATERS

FOSTER WHEELER

FRACTIONATING TOWERS HEAT EXCHANGERS
STEAM JET AIR PUMPS SUPERHEATERS
TUBE STILLS VACUUM PUMPS
WATER COOLED FURNACE SURFACE
BRASS AND COPPER TUBING AND PIPE



Specifications

Century motor
Webster transformer
Tuthill Pump
Contactor controls
Nozzle, strainers
Diaphragm oil regulating valves and all other parts York built

Write for further details and sales plan

$395, *completely installed with 275-gallon tank*

A very low-priced, high-grade, mechanical atomizing burner.
Long discount from this price.
Electric ignition, extremely quiet operation.
Approved to burn 28 gravity oil.

York Automatic has become the leading burner in a number of cities.

Proof that our policy of building the finest burner possible to build, and then selling it to the trade for the lowest price possible, is the way to volume business and satisfactory profits for the distributor.

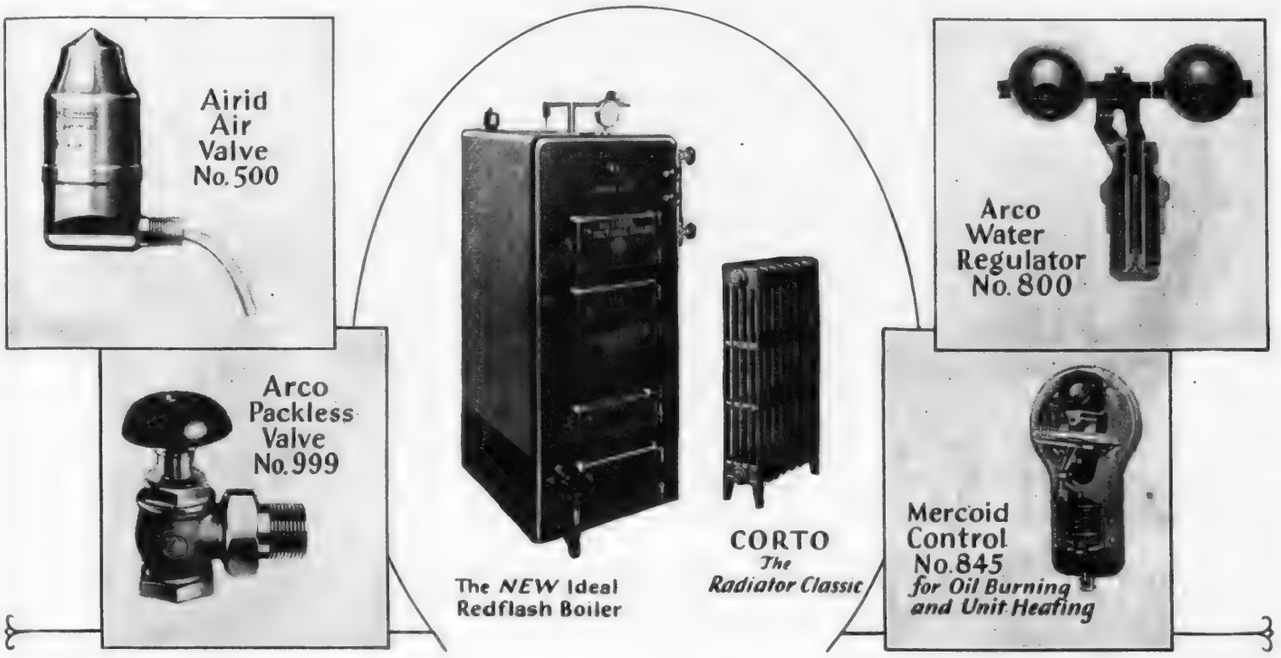
Nine years of building burners have permitted us to cut production costs, maintain quality, give sales and engineering assistance and still sell the York Automatic for little more than half the price of similar machines.

If you are at present selling burners, you need the York Automatic to round out your line of burners.

If not in the burner business, this gives you a splendid opportunity to make a connection with one of the fastest growing oil burner companies.

YORK OIL BURNER COMPANY, 21 WEST CLARK AVENUE YORK, PA.

Undivided Responsibility Backs This Complete Line of Heating Accessories



You can sell every home owner a complete AMERICAN RADIATOR job

YOU CAN build a bigger business with more profit if you sell American Radiator Accessories for every installation. Sell an American Radiator Heating Plant—Redflash Boiler and Corto Radiators completely equipped with American Accessories—one complete job. It will mean only one *undivided* responsibility for you and your customer.

This will appeal to every buyer of heating equipment. They *know* American Radiator quality and they will quickly see the advantage that comes from having only one responsibility. And in case of trouble no one can "pass the buck."

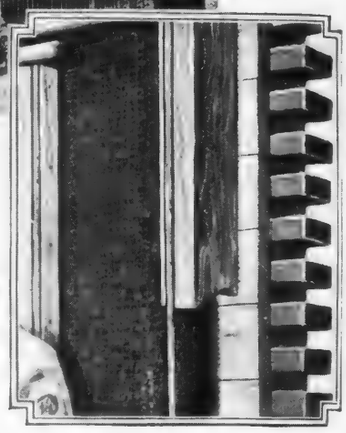
There are no better Heating Accessories made than the complete American Radiator line. In the world's largest Heating Accessories plant and laboratories these products are designed, tested and manufactured by men with years of experience and reputation for quality and precision production.

It is a mistake to handicap good boilers and radiators with inferior valves, vents and regulators. Heating systems completely equipped with American Radiator Accessories are better plants.

AMERICAN RADIATOR COMPANY

40 West 40th Street ACCESSORIES DIVISION, DEPT. AAV78 New York, N. Y.

The home of Joseph A. Blake, Detroit, Michigan. Hiram J. Homer, Architect and Builder. Complete specifications for thermal insulation—1" Flax-li-num in the ceiling, ½" flanged in side walls.



Build for all year 'round comfort-

Flax-li-num plus 2 air spaces

FLAX-LI-NUM and the 2-air-space method is truly scientific insulation. Tests by the U. S. Bureau of Standards prove that ½-inch insulation, installed midway between inner and outer walls, equals ¾-inch insulation used as a plaster base, or in contact with the sheathing.

FLAX-LI-NUM comes in ½-inch sheets, cut and shaped to fit in the walls between the studs—and 1-inch sheets in one thickness, ready to install in the roof. FLAX-LI-NUM, in this way, gives maximum results using the least amount of material.

In addition, FLAX-LI-NUM has natural properties which make it ideal for home insulation. It is made from purified flax, formed into sheets by a process which interlocks the flax fibres. It will not tear, break or puncture. Easy to handle and install. It cannot rot.

Homes built with FLAX-LI-NUM are more comfortable in summer because the 2-air-space method *builds* real year'round comfort right into a home.

Send for specifications on FLAX-LI-NUM. Mail the coupon now.

The ½-inch of Flax-li-num thermal insulation is installed in your walls to create two air spaces. The 1-inch sheets for your roof give you the correct thickness in one piece, simplifying the installation and reducing handling costs.

Such construction is scientific — encourages good health — prevents insidious floor draughts — and reduces fuel bills one-third.

FLAX-LI-NUM INSULATING COMPANY, *St. Paul, Minnesota*

Flax-li-num

A CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL

FLAX-LI-NUM INSULATING CO.
St. Paul, Minnesota

Send me results of U. S. Bureau of Standards tests of the two-air-space method of insulation. Also specifications of Flax-li-num.

H. V.-8

Name.....

Address.....

City.....

State.....

This vibration test lasting a period of 3 days produced a longitudinal movement of 1/16th of an inch which occurred at 160 times per minute, a total of 230,400 vibrations. When top halves of conduit were removed no settlement of the filler was observed. Filler on top was just as firm as when first packed.

Expensive Economy

WHERE a project involves a comparatively large investment, to make initial savings at the expense of future efficiency cannot be called good engineering. For heat losses will gobble up the supposed saving in a few months—and continue to make the lines increasingly unprofitable as long as they are in use.

Take a sample case: A 1000 ft. line, 6″ steam pipe, low pressure; season of 5200 working hours, steam cost 25 cents per 1000 pounds. A difference of 5% in efficiency—say, 85%, instead of 90%—would amount to $560 per year, the sum of $11,200 in 20 years, more probably than the first cost of the job. Expensive economy not to make sure of highest efficiency.

Ric-wiL is not the only kind of insulating conduit that will maintain a profitable efficiency. The point is that, regardless of kind, a really efficient conduit will usually cost more than an ordinary one, just as a good boiler costs more than a poor one. It is the engineer's business to be more concerned about how efficient a job he's getting than about how much he can save on the purchase price. The only economical conduit is one of *proved* ability to deliver a profitable efficiency over a long period of time.

We can furnish you with reports of tests showing the more than ample strength of Ric-wiL tile, both conduit and base drain, its water-tightness, the unusually high efficiency of Ric-wiL insulation, the waterproof quality of Dry-paC filler, the fact that it will not sag down from vibration, the fact it will not deteriorate the piping, etc.; and field tests showing Ric-wiL installed efficiency. If we haven't a test to cover any question you may have, we'll arrange to have it made.

THE RIC-WIL COMPANY

Originators of Waterproof Conduit Filler

1567 Union Trust Bldg., Cleveland, O.

Room 924—R. V. Klein

101 Park Ave., New York. 814 Glenn Bldg., Atlanta.

$250.00 per month kept 28 families 30 cars and several stores

Warm and satisfied

(*And Supplied all the hot water as well*)

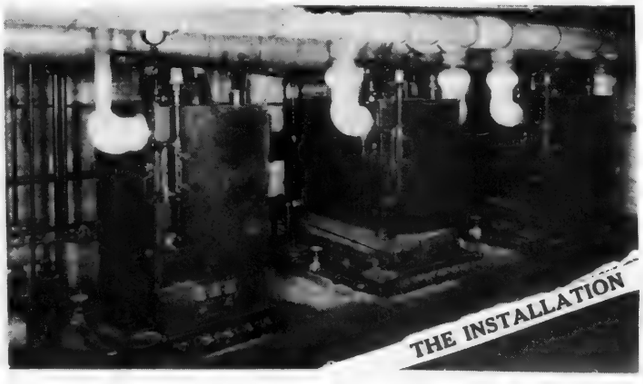
When the three Peerless Gas Boilers (one of ten, one of six and one of five *super sections*) were installed in this modern Dayton, Ohio, apartment house it was an experiment for the owner. As a result of the low heating costs, combined with the superb, "never-worry" service, and the complete satisfaction of all tenants, the owner is turning to gas for heating another (older) apartment in which he has hitherto depended upon fuel oil.

Peerless makes converts for gas heating; these converts are big boosters for Peerless Boilers. One installation sometimes sells a whole neighborhood. When you sell a Peerless you make a salesman for the *Super-Section* Boiler.

Dealers are stocking up for the Fall trade. Get our latest data, our price lists and dealers' helps.

The Peerless Heater Company

Boyertown Pennsylvania



BOOKS ON HEATING AND VENTILATION

THE DESIGN OF GRAVITY-CIRCULATION WATER HEATING SYSTEMS, by F. E. Giesecke, Ph. D. A book, remarkable for its conciseness and clearness of expression, which contains the essence of the information needed for the proper design of gravity water heating systems, based on the principle that the frictional resistance must equal the force maintaining flow. The importance of the presentation is evidenced by the fact that the entire water heating section of the A. S. H. & V. E. Compendium of Modern Practice has been discarded and replaced with a new section by Doctor Giesecke, embodying the methods here presented in detail. 64 pages of text and 10 pages of tables and charts. Price, $3.00.

PLUMBERS' HANDBOOK, by Samuel E. Dibble. This work contains valuable data for the heating engineer and estimator, architect, building contractor and sheet metal worker, as well as for the plumber. Each subject is treated by a specialist, the section on Pipe Standards and Pipe Dies by F. N. Speller and that on Heating by Alphonse A. Adler. Size 4 x 7 in. 629 pp. 316 ills. Cloth, $4.00.

HOUSE HEATING WITH OIL FUEL, by P. E. Fansler, Associate Editor of The Heating and Ventilating Magazine. Prepared for the use of heating and ventilating engineers, heating contractors and those engaged in the oil-burner industry. One of the outstanding features of the book is the presentation of the subject of oil combustion. Over a dozen beautiful and spectacular flame photographs were made particularly for this book in order that the subject of oil combustion might more thoroughly be presented. Three chapters are devoted entirely to the discussion of salient points of the outstanding oil burners that are on the market to-day. The chapter, "Oil Burners Listed by the Underwriters," is the only authentic, chronological list of oil burners that has been listed by the Underwriters in the past. 32 chapters totaling 362 pages and more than 150 illustrations. Size 7 x 10. Price, $4.00 postpaid.

HEATING AND VENTILATION, by the late John R. Allen and J. H. Walker. This is the second edition of this work and has been brought up to date in every particular, including the latest radiator transmission factors put out by the Research Laboratory of the A. S. H. & V. E. and the Hill synthetic air chart testing method. Especially adapted for use as a text book. Size 6 x 9 in. 322 pages Cloth, $3.50.

A. S. H. & V. E. GUIDE, 1928, sixth edition, with previous sections revised and brought up to date. Includes new tables covering heat transmission from building construction, and comprehensive tables for figuring pipe sizes for gravity, vapor, and vacuum steam heating systems, based upon A.S.H. & V.E. Research Laboratory tests on one and two-pipe steam riser capacities. Size 6 x 9 in. 680 pp. and list of A.S.H. & V.E. members. Cloth $4.00.

DESIGNING, HEATING, AND VENTILATING SYSTEM, by Charles A. Fuller. A treatise on the practical application of the engineering rules and formulas in every day use, in laying out steam, hot water, furnace and ventilating equipment for buildings of all kinds, presented in a simple manner. Price $3.00.

HEATING AND VENTILATION, by Charles W. Brabbée. This is the first American edition of the famous Heizungs-und Luftungstechnik, by Dr. H. Rietschel, and C. W. Brabbée, translated from the seventh German edition, edited and revised to make it adaptable to conditions in the United States. Supplemented by 7 charts covering steam and water heating and ventilation. Size 6 x 9 in. 332 pp. cloth $4.50.

PRACTICAL STEAM, HOT WATER HEATING AND VENTILATION, by Alfred G. King. Containing 396 illustrations. The book is a working manual for heating contractors, journeymen, steamfitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8 vo. 367 pages. Price $4.00.

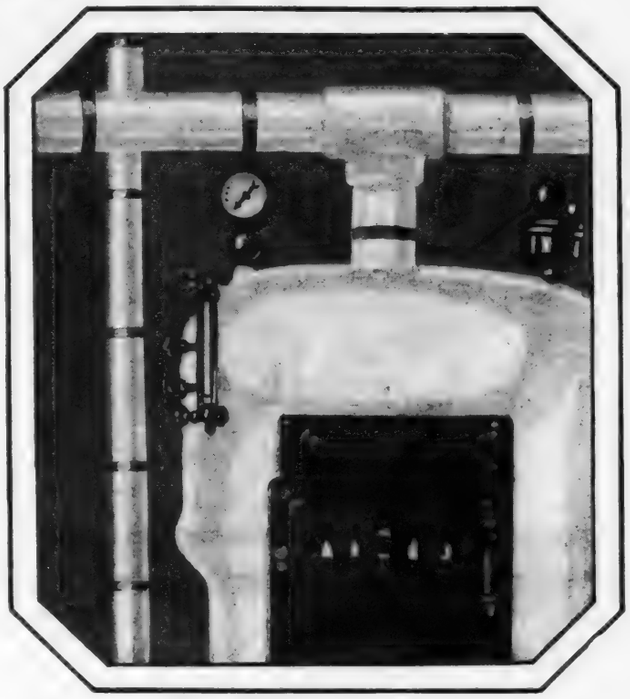
MECHANICS OF HEATING AND VENTILATING, by Konrad Meier. Including a series of ten charts containing data relating to the flow of water, steam and air, collected by Mr. Meier during an experience of 26 years in heating and ventilating work, both in this country and abroad. Each of the charts replaces a series of tables on the subject, giving at a glance the results of a calculation from any combination of factors. 161 pages, illustrated, with ten large charts. Size 6 x 9 in. Price, $5.00. Separate sets of charts printed on cloth, with lines in different colors and mounted on boards. Single charts, $1.50. Sets of ten, $15.00.

HANDBOOK FOR HEATING AND VENTILATING ENGINEERS, by James D. Hoffman. Fourth edition of this important work entirely rewritten and reset. A standard manual covering theory and practice, with special chapters on heat losses, furnace heating, water and steam heating, mechanical vacuum heating, mechanical warm-air heating, temperature control, electrical heating and refrigeration. With appendix of 75 tables. Size 4½ x 6¾ in. Pp. 478. Price $4.50 postpaid.

SHEET-METAL DUCT CONSTRUCTION, by William Neubecker. A treatise on the construction and erection of heating and ventilating ducts and the design and layout of duct fittings. Special chapters devoted to figuring areas and taking off quantities of material. Fourth edition, revised and enlarged. Size 5½ x 8 in. Pp. 225, with 237 illustrations. Cloth $3.00.

THE HEATING and VENTILATING MAGAZINE
386 FOURTH AVE., NEW YORK

Builders Demand insulation that helps sell the house



Improved Asbestocel makes a clean-cut looking job —goes on quicker, too

NOT every person who goes out to buy a house knows much about pipe insulations—but the prospective home buyer does recognize quality, and he also knows famous names such as Johns-Manville.

When you estimate on heating jobs for speculative builders plan to use Improved Asbestocel. The extensive advertising of Johns-Manville is keeping builders constantly sold on Johns-Manville products. If a builder should object to the slightly higher cost of Improved Asbestocel over ordinary air cell, you should point out that the use of Improved Asbestocel is to his advantage fully as much as it is to yours.

All the pipes you cover with Improved Asbestocel will present a neat, even, well-finished appearance impossible to get with ordinary air cell. Such little touches help sell houses.

But chief of all advantages to the speculative builder is the stamp of quality which the name Johns-Manville puts on any building job. Improved Asbestocel is heavily advertised to the public. It is a known product.

The builder who buys Johns-Manville Improved Asbestocel from you is paying very little for a lot of help in moving his houses.

MASTER of ASBESTOS

Johns-Manville

IMPROVED ASBESTOCEL

JOHNS-MANVILLE CORPORATION
New York, Chicago, Cleveland, San Francisco
Branches in all large cities
Canadian Johns-Manville Co., Ltd., Toronto
(Mail this coupon to branch nearest you)

We are interested in your selling plan for Improved Asbestocel.

Name.....

Address.....

City.....State.....

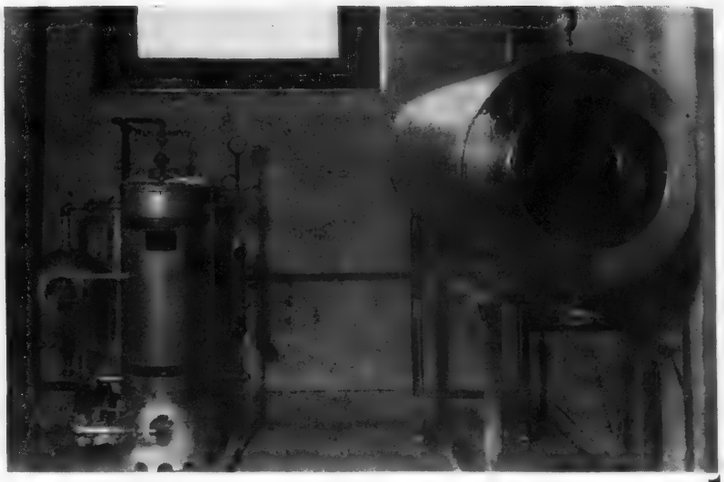
A-64-8

Fast Steaming

dependable, ever ready for "Steam in 4 minutes," The Ofeldt is the ideal source of steam for the thousand and one uses which require an abundance of steam "on and off" during the day.

Clean operation is a marked feature of The Ofeldt — it can be placed anywhere! It takes but little space, uses fuel sparingly, and is entirely automatic from the touch of the match flame to the turning off of the gas.

"Steam in 4 minutes"
Ofeldt
TRADE MARK
WATER TUBE
Automatic
Gas Boiler



The Sturdy, Dependable Ofeldt on the Job Supplying Steam to a Sterilizer

Send for Literature

MEARS-KANE-OFELDT INCORPORATED

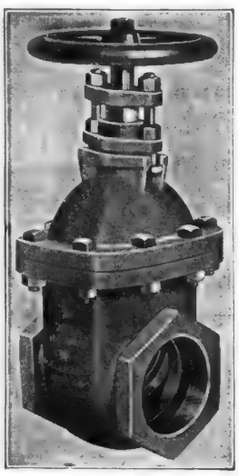
Manufacturers of

GAS FIRED BOILERS AND WATER HEATERS

1903-1915 EAST HAGERT STREET PHILADELPHIA

New York—9 Park Place
Boston—100 Arlington St.
Chicago—363 W. Erie St.
Buffalo—Walbridge Bldg.
St. Louis—2010 Locust Blvd.
Los Angeles—940 S. Maple Ave.
Birmingham—American Trust Bldg.

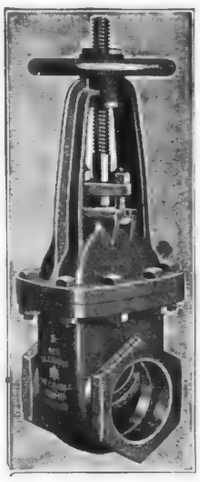
IRON BODY GATE VALVES



SCREWED, FLANGED
AND
HUB END STYLES

NON-RISING STEM
AND
O. S. and Y. PATTERNS

ALSO MANUFACTURERS OF
Cast and Malleable Iron Fittings



Illinois Malleable Iron Company

1801 Diversey Parkway :-: :-: Chicago, Ill.

Practical Help in Figuring Heat Losses

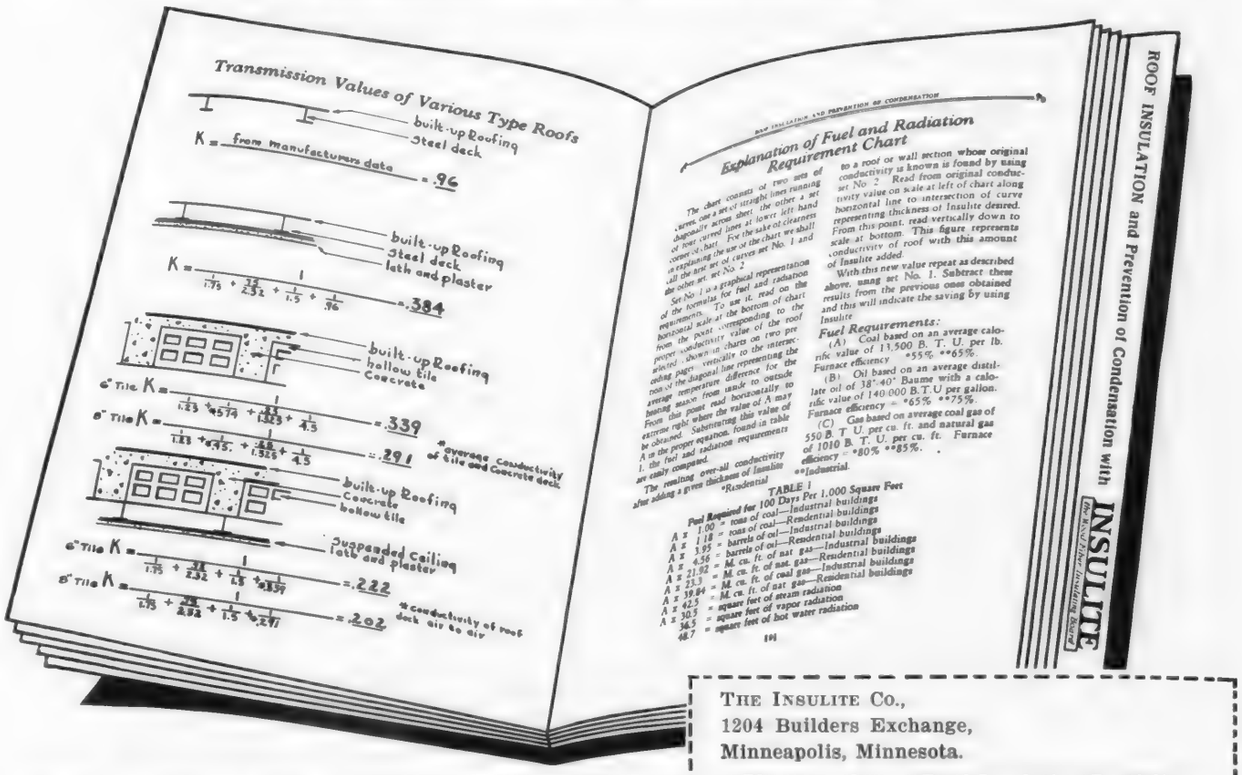
When you figure heating and ventilating installations you will find the INSULITE portfolio on Roof Insulation and Prevention of Condensation exceedingly helpful.

A copy of this portfolio—or more if you need them—will be sent on request.

The solution of the insulation problem at the time the heating requirements are figured is very essential. The INSULITE portfolio contains tables and charts which will be of real assistance in this connection. Write for it today.

INSULITE

the Wood-Fiber Insulating Board



THE INSULITE COMPANY
1204 BUILDERS EXCHANGE
MINNEAPOLIS MINNESOTA

THE INSULITE CO.,
1204 Builders Exchange,
Minneapolis, Minnesota.

Please send your Roof Insulation Portfolio to

Name.....

Address.....

City..... State.....

OIL HEAT—AS BENEVOLENT AS SUNSHINE

NOW is the time!

THESE are the days when oil heating equipment is being sold! As summer draws to a close, home-owners plan for next winter's improvements, and heating contracts for fall building are still to be let.

Self-regulated—as *effortless* as an electric clock—oil heat eliminates the drudgery of the coal pile and substitutes a clean basement, with extra space, and greater cleanliness throughout the house.

They Will Turn To You

Your customers, in ever-increasing numbers, are thinking and talking this modern form of heating. The only question in their minds is *the kind of oil heating equipment best suited to their needs.*

It is to you, as the heating expert in your community that they will look for the facts. It is for you that profit waits on every old-fashioned furnace where this simple installation can be made.

Avail Yourself of This Help

Begin right by getting full information about all reliable types of oil heaters. The Oil Heating Institute can be of immeasurable service in helping you. This organization is the clearing house for information about the oil heating industry. It has for its purpose safeguarding the contractor, his customers and the industry itself.

A series of booklets on oil heat, written by national authorities and containing complete information, together with illustrations, on approved oil heating appliances, are now part of the Oil Heating Institute's service to the public. The coupon will bring the one in which you are most interested.

This is the Emblem of the *Oil Heating Institute*

It is the symbol of satisfactory public service in oil heating.

Only the manufacturers who are members of the Oil Heating Institute are permitted to use it.

These manufacturers have earned their membership through the enthusiasm of thousands of home owners whom they have provided with efficient and dependable oil heat.

This emblem protects you, and it will be protected, on your behalf, by the Oil Heating Institute.

The Oil Heating Institute is prepared to furnish special information on the heating of churches, theatres, hotels, apartment houses and office buildings, and on the various heat treating processes of industry.

OIL HEATING INSTITUTE

420 Madison Avenue New York

Check the book you want

MAIL THE COUPON TODAY!

OIL HEATING INSTITUTE H. & V.-8
420 Madison Ave., New York City

Please send me, free of charge, the following information on oil heating equipment:

Does it Pay to Install an Oil Heater?.....
Are Oil Heaters Perfected?.....
What About the Supply of Oil Fuel?.....
Making Better Use of the Basement.....

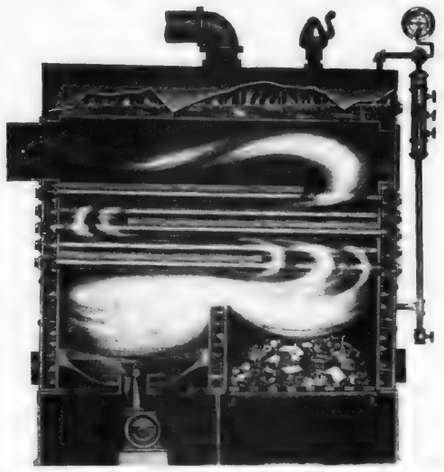
Name .....
Address .....
City.....State .....

HEAT UTILIZATION

Means Economical Operation

Think of the proportion of the intense heat generated by the Oil Burner that the ordinary all-purpose boiler is capable of conserving and utilizing. Then consider

JOHANSON, THE COMBINATION TRIPLE SERVICE BOILER



(Patented Feb. 8, 1927. Beware of infringing imitations)

The 1250 ft. (steam) size. Fired with Oil Burner of standard make, operating at 102.4% of its rated capacity, developed—

Over All Efficiency	81.92%
Average CO_2	11.6 %
Quality of Steam	99.45%
Average Stack Temperature	352.4°

NOTE—Above figures taken from report of one of a series of official tests conducted by accredited Engineers of Armour Institute of Technology, June 22 and 23, 1928. We will gladly send you copy of complete report on request.

Furnishes:

1—Heat for Building.
2—Year-round Domestic Hot Water.
3—Garbage Incineration.

—THREE DISTINCT SERVICES THE YEAR ROUND IN ONE SIMPLE, COMPACT UNIT, DESIGNED AND BUILT ESPECIALLY FOR BEST RESULTS WITH FUEL OIL.

Water Tube Design. Rugged, Welded Steel Construction to A.S.M.E. Boiler Code Specifications.

CAPABLE AND ENERGETIC REPRESENTATION IS DESIRED. RICH TERRITORIES STILL AVAILABLE.

Literature and full information sent on request.

COMBINATION BOILER COMPANY

BENTON HARBOR, MICH.

TRIPLE SERVICE COMBINATION BOILERS — COMBINATION TRIPLE SERVICE BOILERS

Work Out Your INSULATION PROBLEMS With a Banroc Engineer

"Wherever there is a Need for Insulation—there is a Banroc Product to meet it" Says:—

Mr. B.T.U.

THERE is a BANROC Engineer within phoning distance of you, whose business is to help you work out your insulating problems. He is an expert—can go to the bottom of things—furnish you with accurate performance data, give you comparative costs—and make recommendations based upon your own particular conditions.

His services are yours for the asking—without cost or obligation. Consult him on every heat-saving problem. Phone, write or wire the representative nearest you. Let us submit a definite recommendation on some specific problem you are considering.

Representatives in the following cities.
Consult Phone Directory

Boston	Philadelphia	Chicago
New York	Pittsburgh	St. Louis
Buffalo	Cleveland	San Francisco
Newark	Toledo	Houston
Denver	Detroit	Tulsa
	Los Angeles	

Phone Write or Wire
THE REPRESENTATIVE NEAREST YOU

BANNER ROCK PRODUCTS CO.
ALEXANDRIA, INDIANA
ORIGINATORS OF ROCK WOOL PRODUCTS

BANROC INSULATION

Nugent Crank Case Fuel Oil Filter

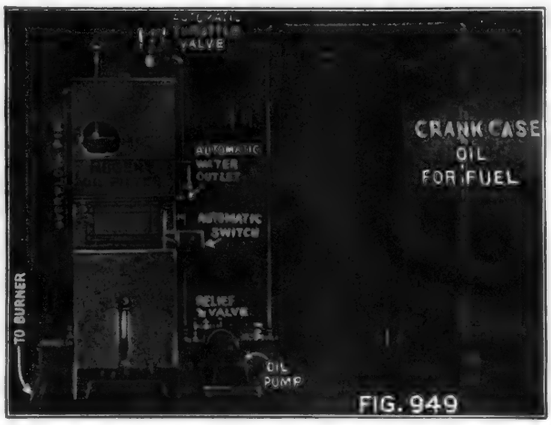


FIG. 949

HEAT YOUR BUILDING WITHOUT COST

BY BURNING DISCARDED CRANK CASE OIL

NO MORE BURNER TROUBLE

Write for catalog

WM. W. NUGENT & COMPANY

409 N. Hermitage Ave., Chicago, U. S. A.

Builders since 1897 of

Oiling Systems — Oiling Devices
Oil Filters — Oil Pumps

NUGENT TRADE MARK

Full Automatic

Any Capacity

Read this Letter

MONARCH GARAGE

1122-1130 HOLLYWOOD AVENUE AT THE L

CHICAGO, ILL.

Wm. W. Nugent & Co. December 19,1927.
Chicago,Ill.

Gentlemen:-

About a year and a half ago we purchased from you a Nugent Oil Filter and motor driven oil pump to filter automobile crank case oil for our oil burner.

This purchase has been one of the best investments we ever made, because the apparatus paid for itself in less than three months. We operate our burner on the filtered crank case oil entirely, consequently we have no fuel bills.

The filter removes the water, dirt, grit, and carbon from the oil so efficiently that the fine mesh strainer at the burner never has to be cleaned, and the burner operates perfectly.

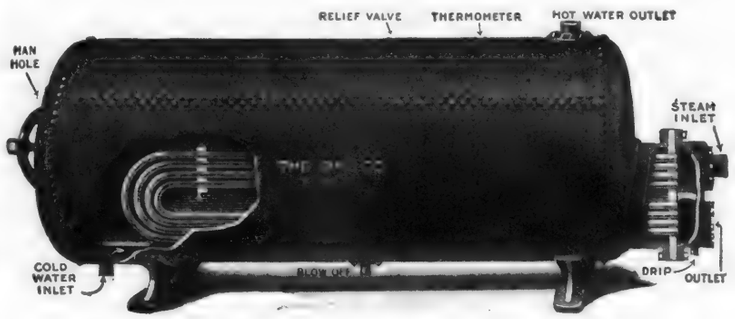
Cleaning the filter requires only ten minutes twice a week and there is no other upkeep to the filter, as the filtering elements will last for years without renewing.

We are very pleased with the filter and pump as well as the service you have given us. We highly recommend your apparatus to anyone.

Very truly yours,

MONARCH GARAGE

By



"We keep others in Hot Water"

SIMS

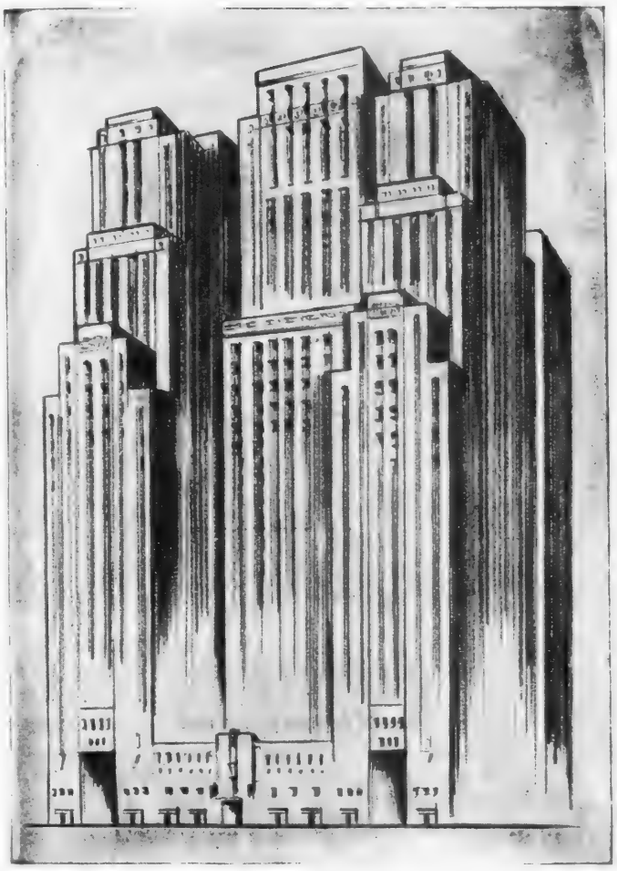
Storage type water heaters are furnished with "U" tubes as illustrated, or with straight tubes and floating head, as may be desired or specified.

SIMS

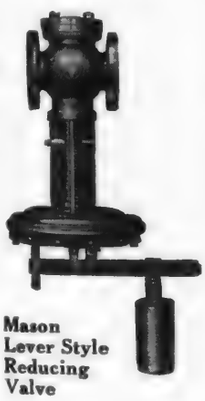
Water tube heaters and Converters are also constructed with either straight or "U" tubes.

All heaters are produced complete in our plant. They are not an assembly of parts built by others.

THE SIMS COMPANY, P. O. Box 700 Erie, Penna.



Mason Regulators in the Graybar Building . . .



Mason Lever Style Reducing Valve

form an important part of the pressure control equipment used in connection with the heating system of the world's largest office building.

The steadily growing list of prominent buildings equipped with Mason Regulators is proof of their dependable, trouble-free operation in service.

Moderate in price, easy to install, no servicing required afterward . . . you will find it profitable to include them in the contracts you are now figuring.

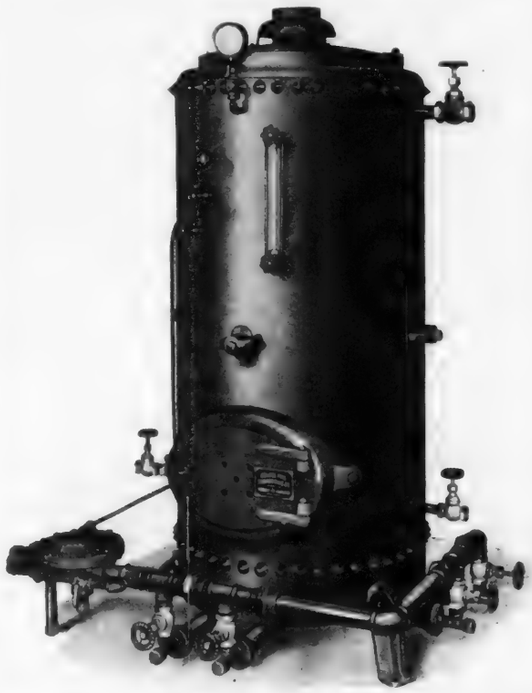
Write for Catalog No. 62.

Mason Regulators

MASON REGULATOR CO.
Boston, Mass.

2134

EVERY CHARACTERISTIC DESIRED IN A STEAM BOILER



DESIGN—vertical fire tube, simple, rugged, time-tried.

FUEL—gas, the ideal fuel, clean, dependable and convenient.

BURNERS—scientifically designed, highly efficient.

CONTROLS—automatic, reliable, keep gas consumption at minimum.

SAFETY — constructed to ASME Power Code, pass all laws.

DEPENDABILITY—continuous, trouble free service, with no delays or costly repairs.

McKEE

AUTOMATIC GAS-FIRED STEAM BOILERS

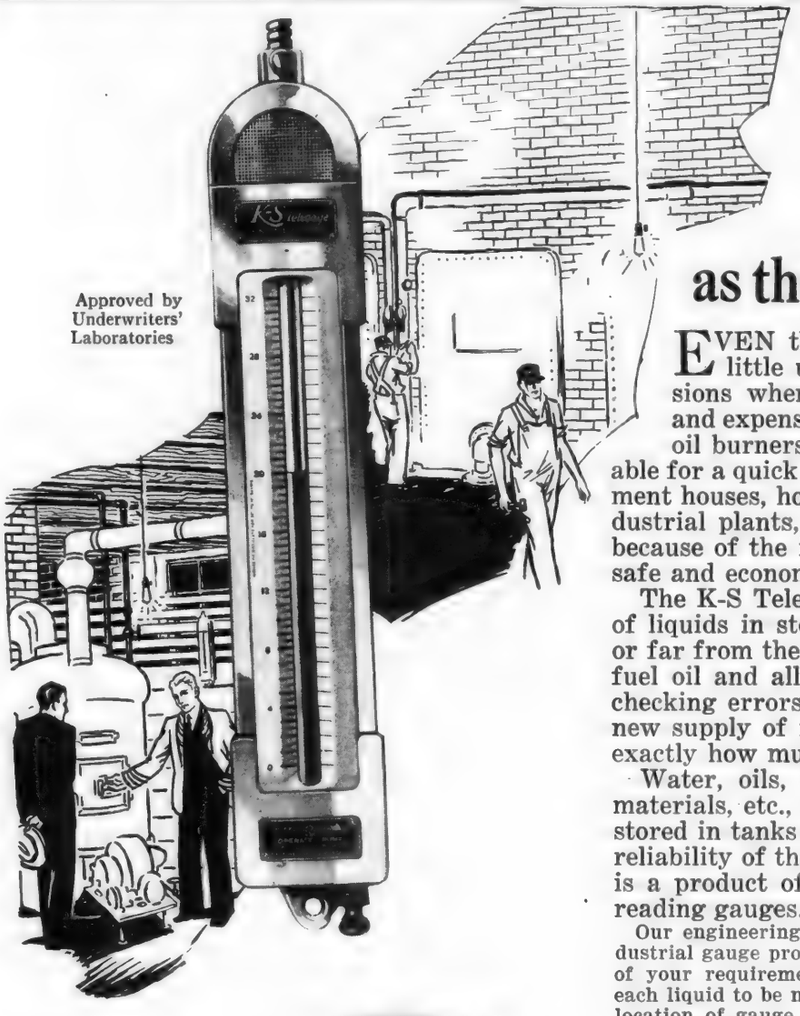
FOR YOUR STEAM PROBLEM

"Write for descriptive folder"

ECLIPSE FUEL ENGINEERING CO.

ROCKFORD 804 South Main Street **ILLINOIS**

THE HYDROSTATIC DISTANT READING GAUGE



Approved by Underwriters' Laboratories

As Vital to Oil Burner Service as the Fuel that It Guards

EVEN the best of oil burner equipment is of little use in one of those embarrassing occasions when the fuel tank goes empty! Trouble and expense are the inevitable result! On domestic oil burners, the K-S Telegage has proved invaluable for a quick and positive check-up of fuel. In apartment houses, hotels, hospitals, public buildings and industrial plants, this check-up is even more necessary because of the important part taken by oil burners in safe and economic operation.

The K-S Telegage tells at a glance the actual depth of liquids in storage tanks. Placed at any point near or far from the tank, this precision instrument guards fuel oil and all other kinds of liquid storage against checking errors and costly failures. It shows when a new supply of fuel oil or other liquids is needed, and exactly how much.

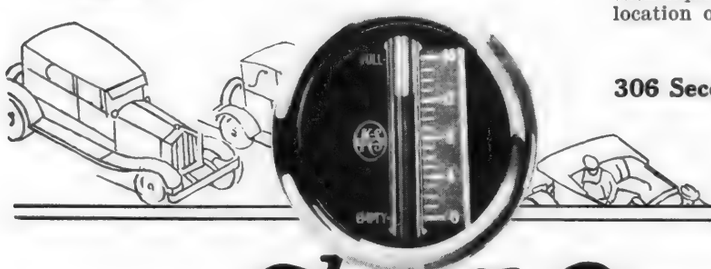
Water, oils, chemicals, gasoline, fuel oil, finishing materials, etc., are a few of the many industrial fluids stored in tanks and guarded by the K-S Telegage. The reliability of the Telegage is assured by the fact that it is a product of the world's largest maker of distant reading gauges.

Our engineering department will be pleased to discuss any industrial gauge problem if you will write, giving a full description of your requirements. Give the Baume or Specific Gravity of each liquid to be measured, and the distance from tank to desired location of gauge. Descriptive folder sent on request.

KING-SEELEY CORPORATION

306 Second Street **Ann Arbor, Michigan**

Branch Offices:
New York—44 Murray Street
Chicago—472 Wrigley Building



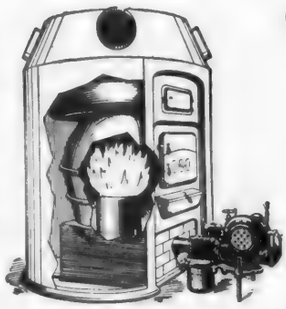
The K-S Telegage

BE CERTAIN WITH THE *K-S TELEGAGE*

Standard factory equipment on three-fourths of all cars selling for $700 or more.

Increase Your Oil Burner Sales

This is the time of the year when oil burner sales are made. Dealers owe it to themselves to sell the best oil burner on the market. The LACO is a proved burner. LACO sales for the first seven months of 1928 are far ahead of the same period in 1927. Increase your profits before the close of the year. The LACO is made in seven sizes—each the lowest priced in its size. The LACO franchise will pave your way to profits.



Check over sales points. See how they compare with other oil burners. And remember that we manufacture a burner that will meet every heating requirement.

$240.00

Complete with full automatic controls

Outstanding Sales Points Put This Burner Over

THE LACO OIL BURNER IS THE ONLY BURNER MADE USING AN INDESTRUCTIBLE WICK

The LACO uses an indestructible mineral wick. The flame never goes out. No ignition is necessary. It is just as simple as the ordinary kerosene lamp. The LACO patented, air-ventilated, double fire-pot keeps the bottom of the wick chamber cool. The flames are confined to the top of the wick and burn any residue along with the gas. There is nothing to get out of order. It is practically noiseless; it is guaranteed not to interfere with radios. It will not cause dirt, smoke, soot or odor. It is actually safer than the ordinary gas range used in a kitchen. There are no adjustments to make. There are thousands of LACO oil burners in service. This must prove that they are dependable. There are seven sizes—EACH THE LOWEST PRICED IN ITS SIZE. Dealers are invited to write for complete information regarding the LACO franchise. Mail the coupon below—today.

Laco Gas Burner Company
411 Union St., Griswold, Iowa, U. S. A.

LACO OIL [GAS] BURNER

DON'T WAIT TOO LONG

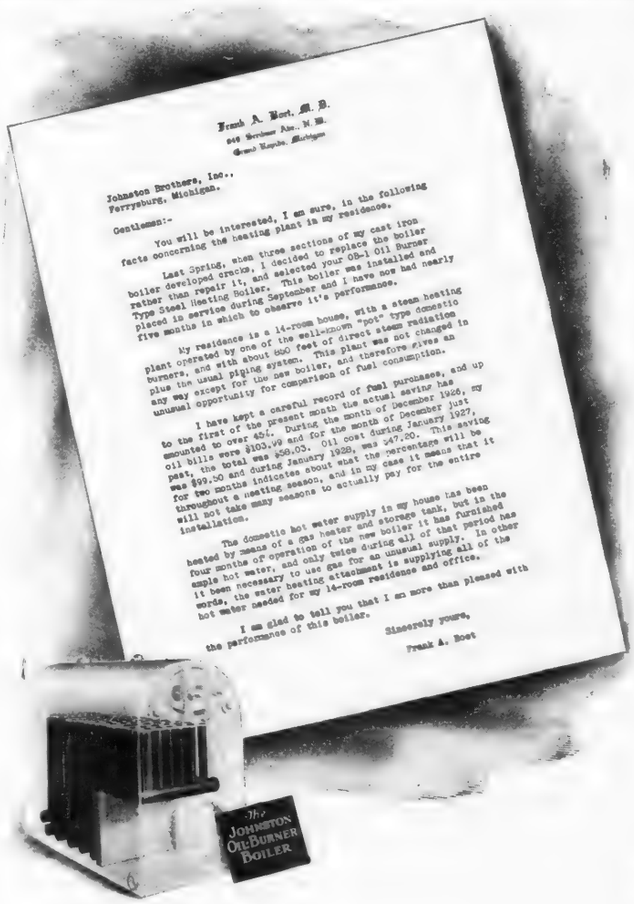
LACO GAS BURNER CO.,
411 Union St., Griswold, Iowa, U.S.A.

Please send me full particulars regarding the LACO franchise.

Name.....

Address.....

Town.....State.....


Frank A. Root, M. D.
Johnston Brothers, Inc.,
Ferrysburg, Michigan.
Gentlemen:-
You will be interested, I am sure, in the following facts concerning the heating plant in my residence.
Last Spring, when three sections of my cast iron boiler developed cracks, I decided to replace the boiler rather than repair it, and selected your OB-1 Oil Burner Type Steel heating boiler. This boiler was installed and placed in service during September and I have now had nearly five months in which to observe it's performance.
My residence is a 14-room house, with a steam heating plant operated by one of the well-known "pot" type oil burners, and with about 600 feet of direct steam radiation plus the usual piping system. This plant was not changed in any way except for the new boiler, and therefore gives an unusual opportunity for comparison of fuel consumption.
I have kept a careful record of fuel purchases, and up to the first of the present month the actual saving has amounted to over $50. During the month of December just oil bills were $103.49 and for the month of December just past, the total was $56.05. Oil cost during January 1927, for two months indicates about what the percentage will be was $99.50 and during January 1928, was $47.20. throughout a heating season, and in my case it means that it will not take many seasons to actually pay for the entire installation.
The domestic hot water supply in my house has been heated by means of a gas heater and storage tank, but in the four months of operation of the new boiler it has furnished ample hot water, and only twice during all of that period has it been necessary to use gas for an unusual supply. In other words, the water heating attachment is supplying all of the hot water needed for my 14-room residence and office.
I am glad to tell you that I am more than pleased with the performance of this boiler.
Sincerely yours,
Frank A. Root

A Boiler that Sells Because It Saves

Every Johnston-Oil-Burner-Boiler installation—because it cuts fuel costs from 25% to 50%—leads to other prospects. Records of performance, and the Johnston Boiler has established some remarkable ones, open the way to greater sales volume.

If you sell oil burners you should also sell Johnston Boilers, because if you sell Johnston Boilers you will sell *more oil burners.*

Write for Catalog and Complete Dealer Proposition.

Johnston Brothers, Inc.

Ferrysburg, Michigan

ENGINEERS' SPECIFICATION INDEX

ACID FUME EXHAUSTERS
Duriron Company, Inc., The, Dayton, O.

AIR COMPRESSORS
American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Nash Engineering Co., So. Norwalk, Conn.
Powers Regulator Co., Chicago, Ill.

AIR CONDITIONING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Heat Transfer Products, Inc., New York
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Typhoon Fan Co., New York.
York Heating & Ventilating Corp., Phila., Pa.

AIR COOLING & DRYING SYSTEMS
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

AIR ELIMINATORS
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

AIR FILTERS
American Blower Co., Detroit, Mich.
Connor Co., Inc., The W. B., New York.
DeBothezat Impeller Co., Inc., New York
General Air Filters Corp., New York.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.
Staynew Filter Corp., Rochester, N. Y.

AIR SEPARATORS
Bishop & Babcock Sales Co., Cleveland, Ohio.
Swartwout Co., The, Cleveland, Ohio.
Western Engineering Co., San Francisco, Calif.

AIR WASHERS
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.

BELTING
Alexander Bros., Inc., Philadelphia, Pa.

BLOWERS, FAN
(See Fans, Supply & Exhaust).

BLOWERS, PRESSURE
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

BLOWERS, ROTARY
Wing Mfg. Co., L. J., New York.

BLOWERS, TURBINE
Buffalo Forge Co., Buffalo, N. Y.
Wing Mfg. Co., L. J., New York.

BOILER CEMENT
Banner Rock Products Co., Alexandria, Ind.
Johns-Manville Corp., New York.

BOILERS, DOWN-DRAFT
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Leader Iron Works, Decatur, Ill.
Molby Boiler Co., New York.
National Radiator Corp., Johnstown, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

BOILERS, GAS-FIRED
American Gas Products Corp., New York.
American Radiator Co., Buffalo, N. Y.
Eclipse Fuel Engineering Co., Rockford, Ill.
Frost Mfg. Co., Galesburg, Ill.
Leader Iron Works, Decatur, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
National Radiator Corp., Johnstown, Pa.
Stanwood Corporation, Cincinnati, Ohio.

BOILERS, HEATING
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
Bryan Steam Corp., Peru, Ind.
Burnham Boiler Co., Irvington, N. Y.
Coatesville Boiler Works, Coatesville, Pa.
Combination Boiler Co., Benton Harbor, Mich.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corporation, New York.
Heggie-Simplex Boiler Co., Joliet, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Kewanee Boiler Corp., Kewanee, Ill.
Leader Iron Works, Decatur, Ill.
Molby Boiler Co., New York.
Monitor Boiler Co., Philadelphia, Pa.
National Radiator Corp., Johnstown, Pa.
Newport Boiler Co., Chicago, Ill.
Orr & Sembower, Inc., Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Peerless Heater Co., Boyertown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Spencer Heater Co., Williamsport, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.

BOILERS, MAGAZINE FEED
Gorton Heating Corporation, New York.
Molby Boiler Co., New York.
Newport Boiler Co., Chicago, Ill.
Spencer Heater Co., Williamsport, Pa.

BOILERS, OIL-FIRED
Bryan Steam Corp., Peru, Ind.
Combination Boiler Co., Benton Harbor, Mich.
Johnston Brothers, Inc., Ferrysburg, Mich.
Leader Iron Works, Decatur, Ill.

BOILERS, POWER
Eclipse Fuel Engineering Co., Rockford, Ill.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Heggie-Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Orr & Sembower, Inc., Reading, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

CALORIMETERS
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

CIRCULATORS, WATER
Janette Mfg. Co., Chicago, Ill.

COILS, PIPE
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Foster Wheeler Corporation, New York.
Heat Transfer Products, Inc., New York
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York
Whitlock Coil Pipe Co., Hartford, Conn.

CONDENSERS
Davis Engineering Corp., New York.
Foster Wheeler Corporation, New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Heat Transfer Products, Inc., New York
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER
Davis Engineering Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLERS, AIR
Alberger Heater Co., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.

COOLERS, OIL
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS & PONDS
Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
Foster Wheeler Corporation, New York.
General Air Filters Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.

COPPER BOILERS
Badger & Sons Co., E. B., Boston, Mass.

COPPER KETTLES
Badger & Sons Co., E. B., Boston, Mass.

COVERING, BOILER, PIPE, ETC.
American District Steam Co., North Tonawanda, N. Y.
Banner Rock Products Co., Alexandria, Ind.
Johns-Manville Corp., New York.
Ric-wiL Co., The, Cleveland, Ohio.
Wyckoff & Son Co., A., Elmira, N. Y.

DAMPERS, DUCT
Buckeye Blower Co., The, Columbus, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Pecco, Inc., St. Louis, Mo.

DAMPER LOCKS, SELF-LOCKING
Northern Weatherstrip Co., Duluth, Minn.

DEHUMIDIFYING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Heat Transfer Products, Inc., New York
Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

DISTILLERS, (WATER)
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRAFT APPLIANCES
Draft-A-Justor Corp., Chicago, Ill.
International Fuel Service Corp., Bridgeport, Conn.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Midwest Air Filters, Inc., Bradford, Pa.
Pecco, Inc., St. Louis, Mo.
Reed Air Filter Co., Inc., Louisville, Ky.
Skinner Bros. Mfg. Co., St. Louis, Mo.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Phila., Pa.

ENGINES, STEAM, AUTOMATIC
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

ENGINES, STEAM, HIGH SPEED
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.

EQUALIZING LOOPS
Hoffman Specialty Co., New York.
Sarco Co., Inc., New York.

EVAPORATORS, BOILER FEED MAKE-UP
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corporation, New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

EXHAUST HEADS
Aeolus Dickinson Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., The, Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

EXHAUST SYSTEMS, ACID
Duriron Company, Inc., The, Dayton, O.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Foster Wheeler Corporation, New York.
Fulton Syphon Co., Knoxville, Tenn.
Gradon Mfg. Co., Philadelphia, Pa.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Walworth Co., New York
Webster & Co., Warren, Camden, N. J

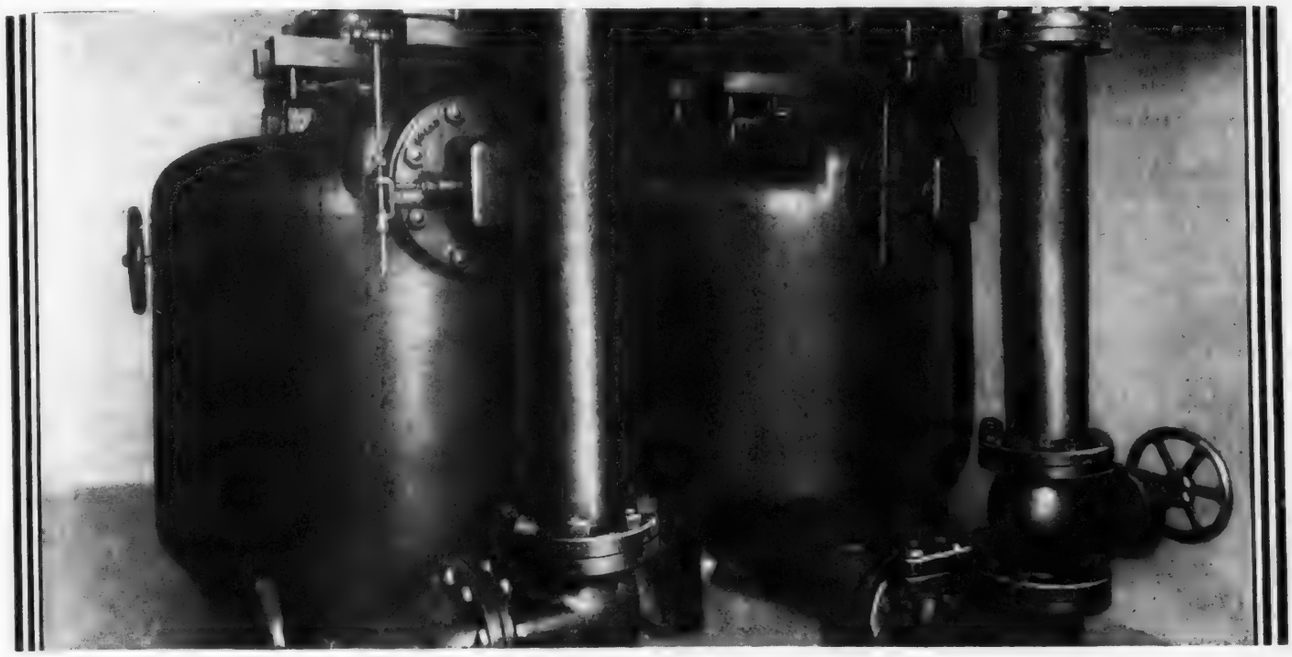
EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

FANS, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

FANS, DISC PRESSURE
DeBothezat Impeller Co., Inc., New York.

FANS, SUPPLY AND EXHAUST
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Emerson Electric Mfg. Co., St. Louis, Mo.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Typhoon Fan Co., New York.
Wing Mfg. Co., L. J., New York.

FEEDERS, BOILER
Cashin Co., W. D., Boston, Mass.
Cissell Mfg. Co., W. M., Louisville, Ky.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Walworth Co., New York.



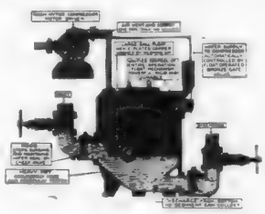
A typical installation of Jennings Sewage Ejector

No air valves—

to complicate the operation of this ejector

THE Jennings Sewage Ejector is of the pneumatic type. That is, air, compressed to the necessary working pressure by a Nash Hytor Compressor, is used as the motive power to pump the accumulated sewage from a pot to the sewer.

Two distinctive improvements in ejector design are to be noted. Air is compressed, delivered, and used only when required. There is no air storage tank. Nor any need for one.



Air valves are avoided. At best, such valves are intricate devices likely to get out of order. They are known to leak during idle periods, causing a serious waste of costly high pressure air. The use of high pressure air reduced for low pressure ejector service is an inefficient practice.

By avoiding complicated air valves and the difficulties they involve, the Jennings Sewage Ejector makes possible simpler, more economical operation. Bulletin 67 is the one to write for.

RETURN LINE AND AIR LINE VACUUM HEATING PUMPS ❦ CONDENSATION PUMPS ❦ COMPRESSORS AND VACUUM PUMPS FOR AIR AND GASES ❦ STANDARD AND SUCTION CENTRIFUGAL PUMPS ❦ ❦ MARINE PUMPS ❦ ❦ SEWAGE EJECTORS ❦ SUMP PUMPS ❦ FLAT BOX PUMPS ❦ HOUSE SERVICE PUMPS

Jennings Pumps

THE NASH ENGINEERING CO 81 WILSON ROAD, SOUTH NORWALK CONN.

FILTERS, (AERATING)
Davis Engineering Corp., New York.

FILTERS, CRANK CASE OIL
Nugent & Co., Inc., Wm. W., Chicago, Ill.

FILTERS, FEED-WATER
Davis Engineering Corp., New York.

FITTINGS, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

FITTINGS, DISTRIBUTOR
Blake Specialty Co., Rock Island, Ill.

FITTINGS, FLANGED
Clow & Sons, James B., Chicago, Ill
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York

FLANGES
Clow & Sons, James B., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Walworth Co., New York

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.

GASKETS, ASBESTOS
Jenkins Bros., New York.
Johns-Manville Corp., New York.

GASKETS, METALLIC
Jenkins Bros., New York.

GASKETS, RUBBER
Jenkins Bros., New York.

GAUGE BOARDS
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Clow & Sons, James B., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.

GAUGES, ALTITUDE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
United States Radiator Corp., Detroit, Mich.

GAUGES, DRAFT
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

GAUGES, OUNCE GRADUATED
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

GAUGES, PRESSURE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

GAUGES, TANK
King-Seeley Corp., Ann Arbor, Mich.

GAUGES, VACUUM
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York

GENERATOR COOLING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Inc., Louisville, Ky.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS, (PUMP)
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio
Titusville Iron Works Co., The, Titusville, Pa

GRATES, ROCKING
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.

GRATES, SHAKING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING AND DUMPING
Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING, CIRCULAR
Fitzgibbons Boiler Co., Inc., New York.
Pyramid Iron Products Corp., New York.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, STATIONARY
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

HEAT CABINETS
Clow & Sons, James B., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Metal Stamping Co., Long Island City.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Trane Co., The, LaCrosse, Wis.

HEATERS, AIR, FAN SYSTEM
Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Rome-Turney Radiator Co., Rome, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

HEATERS, DOMESTIC WATER
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Blake Specialty Co., Rock Island, Ill.
Davis Engineering Corp., New York.
Excelso Products Corporation, Buffalo, N. Y.
Foster Wheeler Corporation, New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Leader Iron Works, Decatur, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Molby Boiler Co., New York.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., The, Erie, Pa.
Taco Heaters, Inc., New York.
Titusville Iron Works Co., The, Titusville, Pa.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, ELECTRICAL UNIT
American Blower Co., Detroit, Mich.

HEATERS, FEED WATER, (CLOSED)
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corporation, New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Gradon Mfg. Co., Philadelphia, Pa.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER, (OPEN)
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

HEATERS, FUEL-OIL
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Electrol, Inc., St. Louis, Mo.
Excelso Products Corporation, Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Heat Transfer Products, Inc., New York
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Taco Heaters, Inc., New York.
Titusville Iron Works Co., The, Titusville, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trane Co., The, LaCrosse, Wis.
Typhoon Fan Co., New York.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

HEATING SYSTEMS, GAS
Clow & Sons, James B., Chicago, Ill.

HEATING SYSTEMS, VACUUM
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis
Sarco Co., Inc., New York.
Spencer Heater Co., Williamsport, Pa.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J

HEATING SYSTEMS, VAPOR
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Spencer Heater Co., Williamsport, Pa
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J

HEATING SYSTEMS, WATER
American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Mueller Co., Decatur, Ill.
Page Boiler Co., Wm. H., New York
Ross Heater & Mfg. Co., Buffalo, N. Y.
Spencer Heater Co., Williamsport, Pa
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York
Grinnell Co., Providence, R. I.
Heat Transfer Products, Inc., New York
Johnson Service Co., Milwaukee, Wis
Midwest Air Filters, Inc., Bradford, Pa
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp. Phila., Pa.

HUMIDITY CONTROL
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark N. J.
Foxboro Co., Inc., The, Foxboro, Mass
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING
Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

INSULATION, BOILER, PIPE, ETC.
(See Covering, Boiler, Pipe, etc.)

INSULATION, BUILDING
Banner Rock Products Co., Alexandria, Ind.
Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.
Johns-Manville Corp., New York.

MANOMETERS
American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass

TEESDALE PUMPS

Set the Pace!
Will you win with them?

Type TU TEESDALE Automatic Pump, capacity 30 gal. per hour, listed as standard by Underwriters' Laboratories. Approved, Board of Standards and Appeals, New York.

IT'S mighty gratifying to lead the field in Automatic Oil Pump Sales. But we want to line up all potential winners to share in TEESDALE success.

National sales and profits are fine, but unless we have you and the other burner dealers who can ride with us to leadership we are not making the most of our opportunity.

Do you want to make more and better profits—and keep them? Then line up with TEESDALE Pumps. Write us today for literature, prices and dealer proposition.

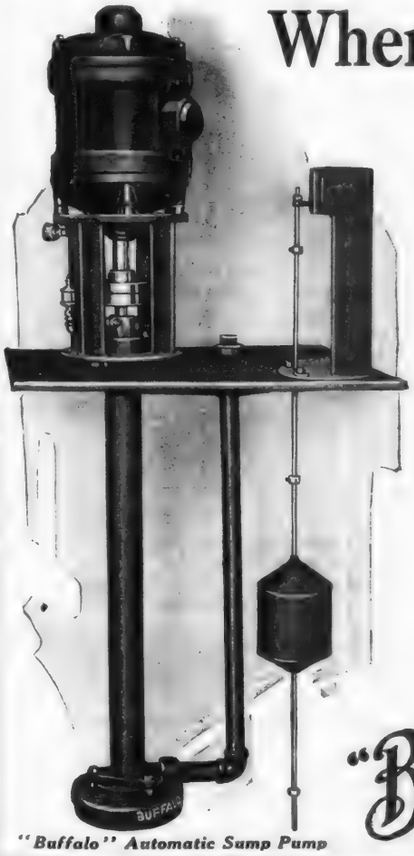
TEESDALE MANUFACTURING CO.
429 Market St., Grand Rapids, Mich.

New York Warehouse:
Walters Warehouse, 410 W. 52nd St.

Philadelphia Branch:
3931 N. Broad Street

Pacific Coast Warehouse:
Taylor-Edwards Warehouse, Seattle

Boston Warehouse:
Wiggins Terminals



"Buffalo" Automatic Sump Pump

Where Sump Pumps are Needed

You will be interested in "Buffalo" Class "C" Vertical Sump Pumps, now made in single or double unit.

The shaft of this pump is entirely enclosed and protected from action of sump water and possibilities of fouling from waste or stringy matter flowing into sump pit.

The ball bearing thrust is provided to carry weight of moving parts (lubricated by oil, not grease) lower ball race resting on spherical seat to permit it to adjust to conditions of alignment.

Complete particulars gladly sent on request.

Buffalo Steam Pump Co.

480 Broadway **Buffalo, N. Y.**

In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" PUMPS TO MEET EVERY REQUIREMENT

MECHANICAL DRAFT APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Mason Regulator Co., Boston, Mass.
New York Blower Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich.

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass.
Spray Engineering Co., Boston, Mass.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Builders Iron Foundry, Providence, R. I.

MOTORS (ELECTRIC)
Baldor Electric Co., St. Louis, Mo.
Century Electric Co., St. Louis, Mo.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Lincoln Electric Co., Cleveland, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

OIL BURNERS
American Nokol Corp., Chicago, Ill.
Automatic Burner Corp., Chicago, Ill.
Cleveland Steel Products Corp., Cleveland, Ohio
Electrol, Inc., St. Louis, Mo.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
Laco Gas Burner Co., Griswold, Iowa.
McIlvaine Burner Corporation, Chicago, Ill.
Nu-Way Corporation, Rock Island, Ill.
Pascoe Company, The Wm. H., Chicago, Ill.
Petroleum Heat & Power Co., New York.
Preferred Oil Burners, Inc., Peoria, Ill.
Winslow Boiler & Engineering Co., Chicago, Ill.
York Oil Burner Co., York, Pa.

OIL BURNER EQUIPMENT
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Draft-A-Justor Corp., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Teesdale Mfg. Co., Grand Rapids, Mich.
Preferred Utilities Mfg. Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster Electric Co., Racine, Wis.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Webster Electric Co., Racine, Wis.

PIPE, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

PIPE, CAST IRON
Clow & Sons, James B., Chicago, Ill.

PIPE, STEEL
Clow & Sons, James B., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PIPE, WOOD
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE HANGERS
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York

PIPE THREADING & CUTTING MACHINES
National Pipe Bending Co., New Haven, Conn.

PRESSURE REDUCING VALVES
(See Regulators, Pressure).

PULLEYS, VARIABLE SPEED
Horton Mfg. Co., Minneapolis, Minn.

PUMPS, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corporation, New York.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, CENTRIFUGAL, VACUUM HEATING
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

PUMPS, CONDENSATION
American Steam Pump Co., Battle Creek, Mich.
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford,
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Weil Pump Co., Chicago, Ill.

PUMPS, OIL
Connor Co., Inc., The W. B., New York.
Janette Mfg. Co., Chicago, Ill.

PUMPS, RECIPROCATING STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.

PUMPS, SUMP
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, TURBINE
Chicago Pump Co., Chicago, Ill.
Foster Wheeler Corporation, New York.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, VACUUM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corporation, New York.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

RADIATOR ENCLOSURES OR SHIELDS
American Metal Products Corp., St. Louis, Mo.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.
United States Radiator Corp., Detroit, Mich.

RADIATORS, BRASS
Rome Brass Radiator Corp., New York.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.

RADIATORS, GAS HEATED
Clow & Sons, James B., Chicago, Ill.

RADIATORS, STEAM & WATER
American Radiator Co., Buffalo, N. Y.
Burnham Boiler Corp., Irvington, N. Y.
Clow & Sons, James B., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Moiby Boiler Co., New York.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
United States Radiator Corp., Detroit, Mich.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Cissell Mfg. Co., W. M., Louisville, Ky.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Draft-A-Justor Corp., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Teeple Co., L. R., Portland, Oregon

REGULATORS, TEMPERATURE
(See Temperature Control).

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Gradon Mfg. Co., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Gradon Mfg. Co., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Swartwout Co., The, Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J.

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

SPRAY NOZZLES
(See Nozzles, Spray).

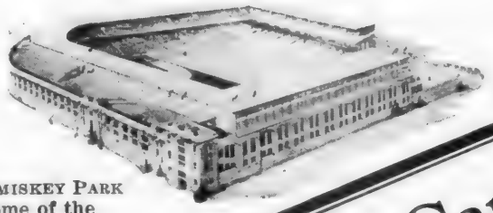
STRAINERS, OIL
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.

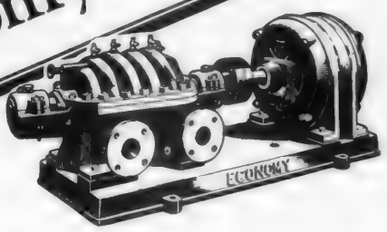
TEMPERATURE CONTROL
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mercoid Corporation, Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Raymond, F. I., River Forest, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Teeple Co., L. R., Portland, Oregon
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

THERMOMETERS, RECORDING & INDICATING
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York



COMISKEY PARK
Home of the
White Sox,
Chicago.

The National Game Economy vs. Waste



In the big ball parks, expenses have to be weighed carefully against gate receipts if the national pastime is to be a paying proposition. Any equipment purchased by big league clubs for maintenance must prove its ability to cut costs.

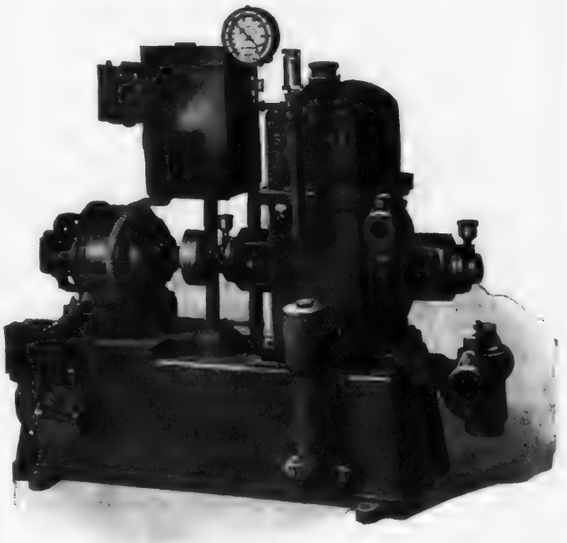
At Comiskey Park, Chicago, ECONOMY Pumps provide economical high pressure needed for clearing stands of pop bottles and other rubbish, and perform heavy duty in the clubhouse. City pressure is increased 150 pounds, variable speed control for low and high pressure is provided, and power bills are kept at a minimum through Economy's efficient operation. It has been found to be a never-failing source of pressure.

Wherever dependable, low-cost pressure is needed—for water power, heat, sewage ejection or some other purpose—there is an Economy Pump to do the job as it should be done. Write for bulletin on type that fits your needs, or talk your problem over with our local representative.

Economy Pumping Machinery Company
3431 West 48th Place, Chicago
Representatives in Principal Cities—
Telephone & Address under Economy Pumping Machinery Co.

Economy Pumps

SKIDMORE



Which Will You Have

high or low water line in the system when operating on float control?

The Skidmore pump on interceptor base is designed to give low water line operation without pitting.

The unit is self contained, ball bearing, and operated by one motor. It produces vacuum on the system even when operating on float control, a desirable feature.

The unit consists of two pumps in one housing on one shaft, an air pump and a centrifugal pump for boiler feed. Motor and pump are mounted directly on interceptor base. This construction means compactness in design and minimum floor space occupied.

The automatic starter together with vacuum regulator and float switch are mounted on this unit. All wiring is installed at the factory.

Bulletin No. 5 illustrating this unit is now available.

SKIDMORE CORPORATION
General Offices and Factory
1535 Dayton St. CHICAGO, U. S. A.
Representatives in principal cities
Canadian Representatives, Darling Bros., Limited
120 Prince Street, Montreal

Powers Regulator Co., Chicago, Ill.
United States Radiator Corp., Detroit, Mich.

THERMOSTATS

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Johnson Service Co., Milwaukee, Wis.
Mercoid Corporation, Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

TRAPS, BUCKET

Swartwout Co., The, Cleveland, Ohio.
Trerice Co., H. O., Detroit, Mich.

TRAPS, FLOAT

Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Sarco Co., Inc., New York.
Swartwout Co., The, Cleveland, Ohio.

TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Works, Three Rivers, Mich.

TRAPS, LIFTING

Lytton Mfg. Corp., Franklin, Va.
Swartwout Co., The, Cleveland, Ohio.

TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Armstrong Machine Works, Three Rivers, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville Corp., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Corp., New York.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., The, Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Clow & Sons, James B., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Corp., New York.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Trerice Co., H. O., Detroit, Mich.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., The, Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNDERGROUND PIPE CONDUITS

American District Steam Co., North Tonawanda, N. Y.
Johns-Manville Corp., New York.
Ric-wiL Co., The, Cleveland, Ohio.
Wyckoff & Son Co., A., Elmira, N. Y.

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, ACID RESISTING

Duriron Company, Inc., The, Dayton, O.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Russell & Co., W. A., New York.
United States Radiator Corp., Detroit, Mich.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton Heating Corporation, New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Stay-Rite Co., Inc., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York

VALVES, BALANCED

Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, BLOW-OFF

Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York

VALVES, CHECK

Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Milwaukee Valve Co., Milwaukee, Wis.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Phila., Pa.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
Walworth Co., New York

VALVES, MAGNETIC

Absolute Con-Tac-Tor Corp., Elkhart, Ind.

VALVES, NON-RETURN

Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Capitol Brass Works, Detroit, Mich.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich
Vapor Engineering Co., New York.
Walworth Co., New York
Webster & Co., Warren, Camden, N. J.

VALVES, REDUCING

(See Regulators, Pressure).

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Walworth Co., New York

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Kainer & Company, Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Radiator Corp., Johnstown, Pa.
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

VALVES, SAFETY

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
National Radiator Corp., Johnstown, Pa.
Stay-Rite Co., Inc., Cleveland, Ohio.
United States Radiator Corp., Detroit, Mich.
Walworth Co., New York

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York
Lakeside Company, The, Hermansville, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Typhoon Fan Co., New York.
Wing Mfg. Co., L. J., New York.

VENTILATING SYSTEMS, ACID

Duriron Company, Inc., The, Dayton, O.

VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
DeBothezat Impeller Co., Inc., New York
Midwest Air Filters, Inc., Bradford, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, MUSHROOM

Aeolus Dickinson Co., Chicago, Ill.
American Blower Co., Detroit, Mich.
American Metal Products Corp., St Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill

VENTILATORS, ROOF

Aeolus Dickinson Co., Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
DeBothezat Impeller Co., Inc., New York
Dwyer Equipment Co., Chicago, Ill.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

WATER STERILIZERS

Clow & Sons, James B., Chicago, Ill

WEATHER STRIPS, METAL

Athey Co., Chicago, Ill.

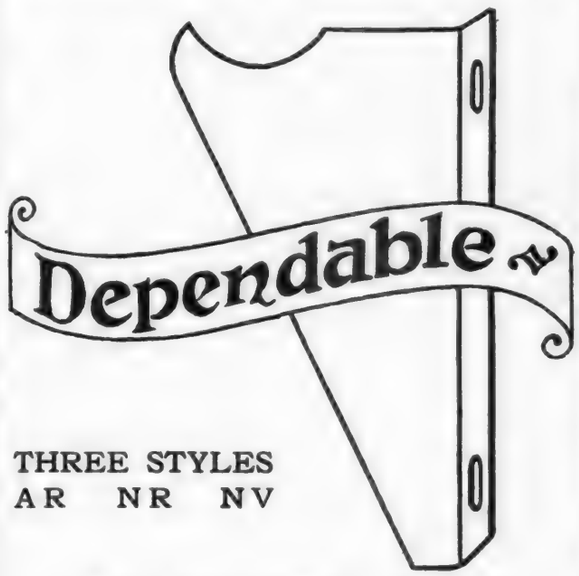
WELDERS, ELECTRIC ARC

Lincoln Electric Co., Cleveland, Ohio.

WRENCHES, STILLSON

Walworth Co., New York.

HARTMANN
RADIATOR BRACKETS



Write for Descriptive Circular and Price List

CHARLES HARTMANN CO.

975-993 Dean Street BROOKLYN, N. Y.

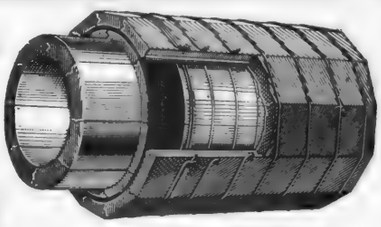
ROSS
Crosshead-GUIDED Expansion Joint Excels in

Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
Once Used—Always Demanded
Every Purchaser—A Customer

ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.

New York, Chicago, Philadelphia, Boston, Cleveland, St. Louis, Detroit, Pittsburgh, Baltimore, San Francisco, Seattle, Denver, Salt Lake City, Omaha, Montreal, Toronto.

Wyckoff's Improved Cypress Covering

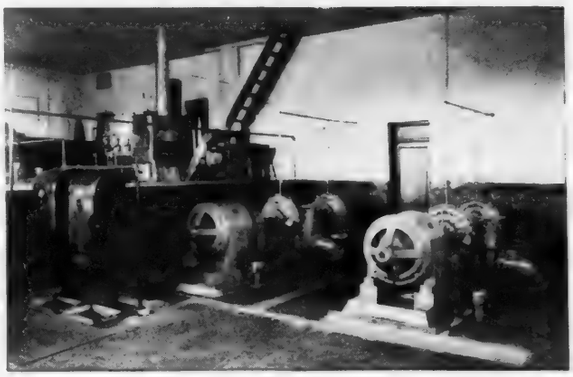


Lasts as Long as The Pipe Itself

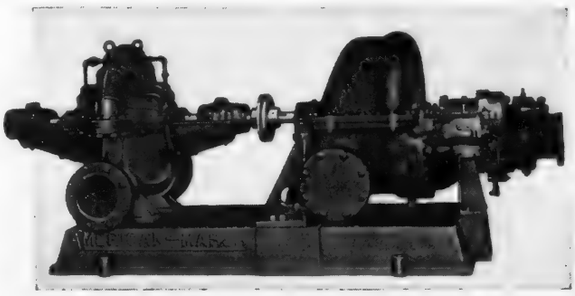
As well as being highly efficient in its application, Wyckoff Improved Cypress Steam Pipe Covering withstands all conditions attending steam pipe trenches. All engineers who know Wyckoff Pipe covering specify it because it lasts.

A. WYCKOFF & SON CO. ELMIRA, N. Y.

AMERICAN MARSH PUMPS



HBM Pumps arranged for two-stage operation



Capacities to 12,000 g.p.m.— low and medium high heads

Improved Efficiencies

WITHOUT radical departures from sound, accepted standards, American-Marsh engineers have added extra high efficiencies to this dependable line of HBM Single Stage, Split Case Centrifugal Pumps. Thus operating costs have been reduced substantially.

Before you next purchase pumps for boiler-feed, circulating hot or cold water, air washer service, boosting city water pressures, etc., by all means investigate this important American-Marsh development.

Our engineers can show you some very interesting economies. Write for new Bulletin 38, giving full details on the Improved Type HBM Centrifugal Pumps.

AMERICAN STEAM PUMP COMPANY
BATTLE CREEK, MICHIGAN

AMERICAN-MARSH
HBM Centrifugal Pumps

ALPHABETICAL INDEX OF ADVERTISEMENTS

A

Absolute Con-Tac-Tor Corp. 37
Aeolus Dickinson 136
Aerofin Corporation 46
Alberger Heater Co..... 154
Alexander Bros., Inc..... 130
American Blower Co..... —
American District Steam Co..... 157
American Gas Products Corp.... 17
American Metal Products Corp.. 130
American Nokol Corp..... 26
American Radiator Co. 32, 47, 153, 165
American Schaeffer & Budenberg Corp. 136, 155, 159
American Steam Pump Co..... 185
Ames Pump Co..... 109
Armstrong Machine Works..... 134
Athey Co. 124
Atlas Valve Co..... 146
Automatic Burner Corp..... 20
Autovent Fan & Blower Co..... 113

B

Badger & Sons Co., E. B..... 163
Baldor Electric Co..... 138
Banner Rock Products Co..... 173
Barnes & Jones..... —
Bayley Blower Co..... 123
Bishop & Babcock Sales Co..... 34
Blake Specialty Co..... 160
Bristol Co. 124
Brownell Co. 152
Bryan Steam Corp..... 160
Buffalo Forge Co..... 119
Buffalo Steam Pump Co..... 181
Builders Iron Foundry..... 162
Burnham Boiler Corp..... 8

C

Capitol Brass Works..... 132
Carrier Air Conditioning Co. of America 119
Carrier Engineering Corp..... 122
Cashin Co., W. D..... 148
Central Station Steam Co..... 138
Century Electric Co..... 147
Chace Valve Co., W. M..... 150
Chicago Pump Co..... —
Cissel Mfg. Co., W. M..... 140
Clarage Fan Co....Inside Front Cover
Cleveland Gas Burner & Appliance Co. 35
Cleveland Steel Products Corp... 30
Clow & Sons, James B..... 158
Coatesville Boiler Works..... 9
Combination Boiler Co..... 172

D

Davis Engineering Corp..... 136
Day s Regulator Co., G. M..... 132
DeBothezat Impeller Co..... 118
Draft-A-Justor Corp. 158
Dunham Co., C. A..... 40
Duriron Co., Inc..... 120
Dwyer Equipment Co..... 127

E

Eclipse Fuel Eng. Co..... 175
Economy Pumping Machinery Co. 183
Electrol, Inc. 33
Emerson Electric Mfg. Co..... 126
Excelso Products Corp..... —

F

Fitzgibbons Boiler Co..... 144
Flax-li-num Insulating Co..... 166
Foster Wheeler Corp..... 164
Foxboro Co., Inc..... —
Frank Heater & Engineering Co., Inc., O. E..... 152
Frost Mfg. Co..... 15
Fulton Sylphon Co..... 48

G

General Air Filters Corp..... 126
Gorton Heating Corp..... —
Gradon Mfg. Co..... 154
Grinnell Co., Inc..... 115

H

Haines & Co., Wm. S..... 186
Hardinge Brothers, Inc..... 29
Hartmann Co., Chas..... 185
Healy-Ruff Co. 126
Heat Transfer Products, Inc.... —
Heggie-Simplex Boiler Co..... 50
Hoffman Specialty Co....Back Cover
Hornung, J. C..... 144
Horton Mfg. Co..... 136

I

Illinois Engineering Co...Front Cover
Illino's Malleable Iron Co..... 170
Insulite Co. 171
International Fuel Service Corp.. 150

J

Janette Mfg. Co..... 148
Jenkins Bros. 140
Johns-Manville Corp. 169
Johnson Co., S. T..... —
Johnson Service Co..... 18
Johnston Brothers, Inc..... 177

K

Kainer & Company..... 22
Kewanee Boiler Corp..... 3
Kieley & Mueller, Inc..... 45
King-Seeley Corp. 176
Knowles Mushroom Ventilator Co. 122

L

Laco Gas Burner Co..... 177
Lakeside Co. 130
Leader Iron Works..... 23
Lincoln Electric Co..... 149
Lytton Mfg. Co..... 142

M

Marsh & Co., Jas. P..... 142
Marsh Valve Co..... 42
Mason Regulator Co..... 175
McAlear Mfg. Co..... 36
McDonnell & Miller..... 39
McIlvaine Burner Corp..... 154
McQuay Radiator Corp..... 137
Mears-Kane-Ofeldt, Inc. 170
Mercoid Corp., The..... 38
Metal Stamping Co..... 140
Midwest Air Filters, Inc..... —
Milwaukee Valve Co..... 49
Modine Mfg. Co..... 122
Molby Boiler Co..... 148
Monitor Boiler Co..... 14
Mueller Co. 31

N

Nash Engineering Co.....112, 179
National Air Filter Co..... 139
National Pipe Bending Co..... 146
National Radiator Corp..... 10
National Regulator Co..... 150
National Tube Co..... 16
Nelson Corp., Herman..... 135
Newport Boiler Co..... —
New York Blower Co..... 121
Northern Weatherstrip Co..... 122
Nugent & Co., Inc., Wm. W.... 174
Nu-Way Corp. 21

O

Oil Heating Institute..... 172
Orr & Sembower, Inc. 13

P

Pacific Steel Boilers Corp..... 4
Page Boiler Co., Wm. H..... 5
Patterson-Kelley Co. 156
Peerless Heater Co..... 168
Peerless Unit Ventilation Co.... 133
Petroleum Heat & Power Co.... 25
Phillips Drill Co..... 138
Pierce, Butler & Pierce Mfg. Corp. 6
Powers Regulator Co..... 107
Preferred Oil Burners, Inc..... 111
Preferred Utilities Mfg. Corp... 156
Pyramid Iron Products Co..... 152

R

Raymond, F. I..... 161
Reed Air Filter Co., Inc..... 141
Ric-wiL Co. 167
Rome Brass Radiator Corp..... 143
Rome-Turney Radiator Co..... 128
Ross Heater & Mfg. Co..... 185

S

Sarco Co. 52
Schutte & Koerting Co..... —
Shaw-Perkins Mfg. Co..... 145
Simplex Heating Specialty Co... 138
Sims Co. 174
Skidmore Corp. 183
Skinner Bros. Mfg. Co..... 129
Spencer Heater Co..... 7
Spray Engineering Co..... 130
Stanwood Corp. 12
Staynew Filter Corp..... 120
Stay-Rite Co., Inc..... —
Sterling Engineering Co..... 152
Sturtevant Co., B. F.....117, 131
Swartwout Co. 144

T

Taco Heaters, Inc..... 151
Teeple Co., L. R..... 160
Teesdale Mfg. Co..... 181
Thrush & Co., H. A..... 27
Titusville Iron Works Co..... 11
Trane Co. 43
Trerice Co., H. O..... 146
Typhoon Fan Co..... 128

U

United States Radiator Corp..... —

V

Vapor Engineering Co..... 146
Ventilating Products Co..... 128

W

Walworth Co. 19
Want Ads 118
Webster & Co., Warren..... 44
Webster Electric Co..... 28
Weil-McLain Co...Inside Back Cover
Western Engineering Co..... —
Whitlock Coil Pipe Co..... 154
Wing Mfg. Co., L. J.....125, 132
Winslow Boiler & Engr. Co..... 24
Wolverine Tube Co..... 41
Wyckoff & Son Co., A..... 185

Y

York Heating and Ventilating Corp. 124
York Oil Burner Co..... 164

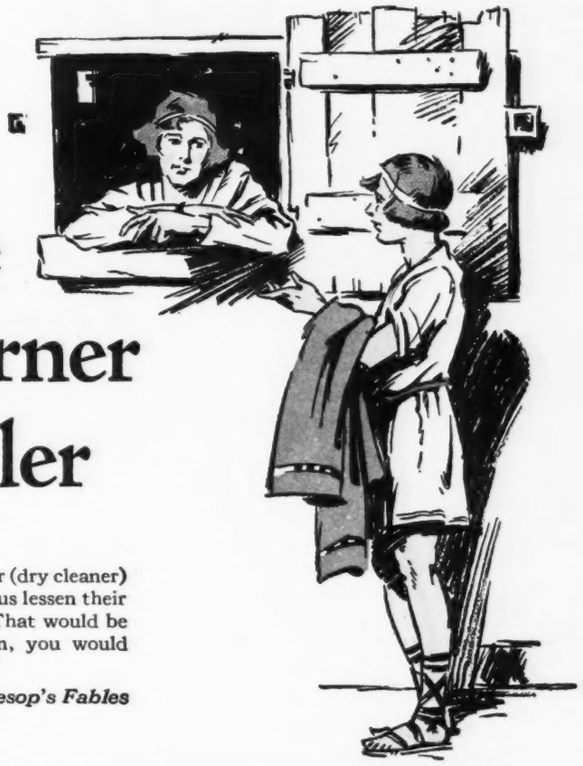
Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines

HAINES

AFTER ALL

Your vacuum heating system is no more efficient than your Radiator Traps permit it to be.

Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines



Fable of the Charcoal Burner *and the* Fuller

A charcoal burner once suggested to a fuller (dry cleaner) that they occupy the same quarters and thus lessen their expenses. The fuller objected, replying "That would be impossible, for whatever I should whiten, you would immediately blacken with your charcoal."

—Aesop's Fables

And so a heating contractor, possessing a spotless reputation for quality heating, may entertain the thought of adopting cut price selling in hope of increasing his business and profits.

A little reflection, however, usually convinces him that to join hands with cut price competition would probably blacken or injure his reputation and finally reduce his profits.

He decides, instead, to submit with his bids and emphasize to his customers such fuel-saving advantages as Weil-McLain Corrugated Heating Surfaces, Long Back-and-Forth Fire Travel and Scientific Combustion, because he knows that in the end this will yield him greater profits.

WEIL-McLAIN COMPANY

General Offices	Boiler Factory	Radiator Factory
Chicago, Illinois	Michigan City, Indiana	Erie, Pa.

Fight Fuel Waste with

Weil-McLain

SCIENTIFIC COMBUSTION

BOILERS

"SEE THE WEIL-McLAIN JOBBER IN YOUR TERRITORY"

406

He scooped up 4 HOFFMAN CONTROLLED HEAT JOBS in one day!

Paul Niehoff of Milwaukee puts across a novel idea

PAUL NIEHOFF borrowed the secret that helped bring success to the automobile business. He proved that a heating contractor can make big money by using modern merchandising methods — by demonstration—by *"showing 'em how it ticks."*

Paul Niehoff's own story

Mr. Niehoff was about to open his new quarters. The new showroom was fitted out with a model Hoffman Controlled Heat Job, using a small gas boiler. Mr. Niehoff realized the importance of a complete demonstrating unit, with which he could actually show the prospect exactly how this modern system operates.

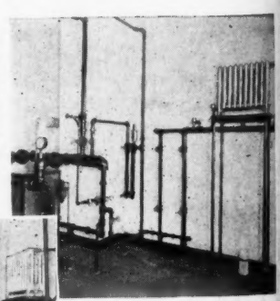
Invitations were mailed to local architects, builders and owners, to attend the opening of the new shop, and inspect the model system in operation.

The invitations were followed up by the telephone calls. A local newspaper carried an editorial story announcing the demonstration.

On the opening days, February 23, 24 and 25, the shop was crowded. Mr. Niehoff was afforded an excellent chance to make customers. He did. *The first day Mr. Niehoff signed up four new Hoffman Controlled Heat jobs,* and laid the ground for a whale of a lot of future business. This clever move put Niehoff's business on the map in jigtime —a business *built around Hoffman products.*

It Isn't Difficult

What the Niehoff Company did indicates a trend in the heating business. Modern methods used in other lines of business will more and more be used by progressive contractors. It's time to "get on the band-wagon" *now.*



Niehoff's complete Hoffman Controlled Heat demonstrating plant enables him to show every detail of operation. The small gas boiler furnishes steam and makes it possible for Mr. Niehoff to demonstrate each step of operation under actual working conditions.

At left, a photograph of a corner of the Niehoff showroom. Note complete pipe lines and radiators at different points. Certainly *his* customers need not order their heating plants merely on faith. They can see for themselves exactly how the system works.

HOFFMAN SPECIALTY COMPANY, INC.
Dept. C-41, 25 West 45th Street, New York City
Makers of the famous "Watchman-of-the-coal-pile" Air Valves